

## A revision of the Japanese genera and species of the subfamily Theridiinae (Araneae: Theridiidae)

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**Abstract** — A revision of the Japanese genera and species of the subfamily Theridiinae Sundevall 1833 (Araneae: Theridiidae) is given. Hooded paracymbium of male palpus and absence of colulus characterize Theridiinae. Monetinae Simon 1894 and Spintharinae Simon 1894 are newly synonymized with Theridiinae. Keys to the subfamilies of Theridiidae and the genera of Theridiinae are given.

Two genera, *Paidiscura* Archer 1950 and *Rugathodes* Archer 1950, are newly recorded from Japan and three new genera, *Nipponidion*, *Takayus* and *Keijia*, are described. Eleven species are newly transferred from *Theridion* to those genera: *P. subpallens* (Bösenberg & Strand 1906), *R. nigrolimbata* (Yaginuma 1972), *N. yaeyamense* (Yoshida 1993), *Ta. takayensis* (S. Saito 1939), *Ta. chikunii* (Yaginuma 1960), *Ta. latifolius* (Yaginuma 1960), *Ta. yunohamensis* (Bösenberg & Strand 1906), *Ta. subadultus* (Bösenberg & Strand 1906), *Ta. lyricus* (Walckenaer 1842), *K. sterninotata* (Bösenberg & Strand 1906) and *K. mneon* (Bösenberg & Strand 1906).

Three new species are described: *Nipponidion okinawense*, *Keijia maculata* and *Theridula iriomotensis*. *Theridula albipes* S. Saito 1935 described from Sakhalin is newly transferred to *Chrysso*. Three species names, *Chrysso venusta* (Yaginuma 1957), *C. rapula* (Yaginuma 1960) and *Theridion adamsoni* Berland 1934, are newly synonymized with *C. scintillans* (Thorell 1895), *C. albipes* and *Keijia mneon*, respectively. Neotype of *Takayus takayensis* (S. Saito 1939) is designated.

Fifteen Chinese or American species of *Theridion* are newly transferred to the other genera as follows: *Takayus kunmingicus* (Zhu 1998), *Ta. naevius* (Zhu 1998), *Ta. lushanensis* (Zhu 1998), *Ta. xui* (Zhu 1998), *Ta. linimaculatus* (Zhu 1998), *Ta. wangi* (Zhu 1998), *Ta. sublatifolius* (Zhu 1998), *Ta. lunulatus* (Guan & Zhu 1993), *Ta. huanrenensis* (Zhu & Gao 1993), *Ta. quadrimaculatus* (Song & Kim 1991), *Keijia qionghaiensis* (Zhu 1998), *K. tincta* (Walckenaer 1802), *K. antoni* (Keyserling 1884), *K. alabamensis* (Gertsch & Archer 1942) and *K. punctosparsa* (Emerton 1882).

Three species names, *Theridion argyrodiforme* Bösenberg & Strand 1906, *Th. indicis* Bösenberg & Strand 1906 and *Th. sagaphilum* Strand 1916, are treated as *nomina dubia*.

**Key words** — Theridiinae, Theridiidae, revision, new genera, new species, Japan.

### Introduction

Spiders of the genus *Theridion* Walckenaer 1805, s. lat., (Theridiidae) are small to medium-sized spiders building three-dimensional irregular webs. The genus is one of the largest spider genera and more than 40 species have been described or recorded from Japan, and of those a total of 24 species are now recognized as valid names (Tanikawa 2000). For the spiders of the genus, some arachnologists used more subdivided genera such as, *Paidiscura* Archer 1950, *Nesticodes* Archer 1950, *Rugathodes* Archer 1950 and *Neottiura* Menge 1868

(Archer 1950; Wunderlich 1987; Platnick 1993, 2001; Zhu 1998; Knoflach 1999; Knoflach & Thaler 2000). Although the subdivision has not been fully applied to Japanese species of *Theridion* s. lat., some species have already been treated under those subdivided genera; e.g., *Nesticodes rufipes* (Lucas 1846) (Zhu 1998), *Neottiura bimaculata* (Linnaeus 1767) and *Neottiura margarita* (Yoshida 1985) (Knoflach 1999).

In this paper, Japanese species of the genus *Theridion* s. lat. and other genera of the subfamily Theridiinae are fully revised. Consequently, three new species each belonging to different genera and three new genera, *Nipponidion*, *Takayus* and *Keijia*, are described.

In addition, a total of 24 species are newly transferred to the other genera and three species names are newly synonymized; and as a result, two species of *Nipponidion*, 16 of *Takayus*, one of *Paidiscura*, one of *Rugathodes* and eight of *Keijia* are newly recorded.

Japanese species of the family Theridiidae consist of four subfamilies: Theridiinae Sundevall 1833, Episininae Simon 1894, Argyrodinae Simon 1894 and Hadrotarsinae Thorell 1881. Keys to the four subfamilies and to the genera of Theridiinae are also given. Forster et al. (1990) proposed the subfamily Spintharinae Simon 1894 for 12 genera (*Anelosimus* Simon 1891, *Chrosiothes* Simon 1894, *Nesticodes*, *Rugathodes*, *Neottiura*, *Chrysso* O. Pickard-Cambridge 1882, *Coleosoma* O. Pickard-Cambridge 1882, *Thymoites* Keyserling 1884, *Theridula* Emerton 1882, *Helvipes* Keyserling 1884, *Tekellina* Levi 1957 and *Spintharus* Henz 1850) on the basis of the presence of hooded paracymbium of male palpus. However, four other genera, *Theridion* s. str., *Paidiscura*, *Moneta* O. Pickard-Cambridge 1870 and *Achaearanea* Strand, 1929 also share a hooded paracymbium. I consider that these 16 genera and three new ones belong to the same subfamily and that the name Theridiinae Sundevall 1833 must be used for this subfamily.

Depositories of specimens excluding my private collection are given in abbreviations: ASJ, Arachnological Society of Japan, Otemon Gakuin University, Osaka; BMNH, British Museum, Natural History, London; CAT, the Private Collection of Akio Tanikawa, Kanagawa; CYC, the Private Collection of Yasunosuke Chikuni, Nagano; HEC, Hebei Educational College, Shijiazhuang, China; KMNH, Kitakyushu Museum and Institute of Natural History, Fukuoka; NSMT-Ar, the Araneae Collection, Department of Zoology, National Science Museum, Tokyo; OMNH, Osaka Museum of Natural History, Osaka; SMF, Senckenberg Museum Frankfurt am Main. For the descriptions, following abbreviations are used as diameters, distances or lengths: ALE, anterior lateral eye; AME, anterior median eye; AME-ALE, between AME and ALE; AME-AME, between AMEs; AW, anterior width; L, length; MOA, median ocular area; PLE, posterior lateral eye; PME, posterior median eye; PME-PLE, between PME and PLE; PME-PME, between PMEs; PW, posterior width.

## Taxonomy

### Family Theridiidae Sundevall 1833

#### Key to the subfamilies of the family Theridiidae

1. Seminal receptacles of female internal genitalia two pairs; palpal claw of female dorso-ventrally flattened; first tarsus with specialized ventral setae .....Hadrotarsinae Thorell 1881
- Seminal receptacles of female internal genitalia one pair; palpal claw of female laterally flattened; first tarsus without specialized ventral setae .....2
2. Paracymbium of male palpus hooded; colulus usually absent .....Theridiinae Sundevall 1833
- Paracymbium of male palpus hooked; large colulus usually present .....3
3. Male carapace usually without various projections; abdomen oval or flattened without posterior tip overhanging spinnerets; snarer building own web .....Episininae Simon 1894
- Male carapace usually with various projections; abdomen usually triangular with posterior tip overhanging spinnerets; kleptoparasite in web of other spiders .....Argyrodinae Simon 1894

#### Subfamily Theridiinae Sundevall 1833

Theridiidae Sundevall 1833, p. 15.

Theridiidae: Simon 1894, p. 531.

Theridiinae: Petrunkevitch 1928, p. 118; Archer 1950, p. 11.

Moneteae Simon 1894, p. 510.

Monetinae: Petrunkevitch 1928, p. 115. **New Synonymy**

Spinthareae Simon 1894, p. 512.

Spintharinae: Forster et al. 1990, p. 112. **New Synonymy**

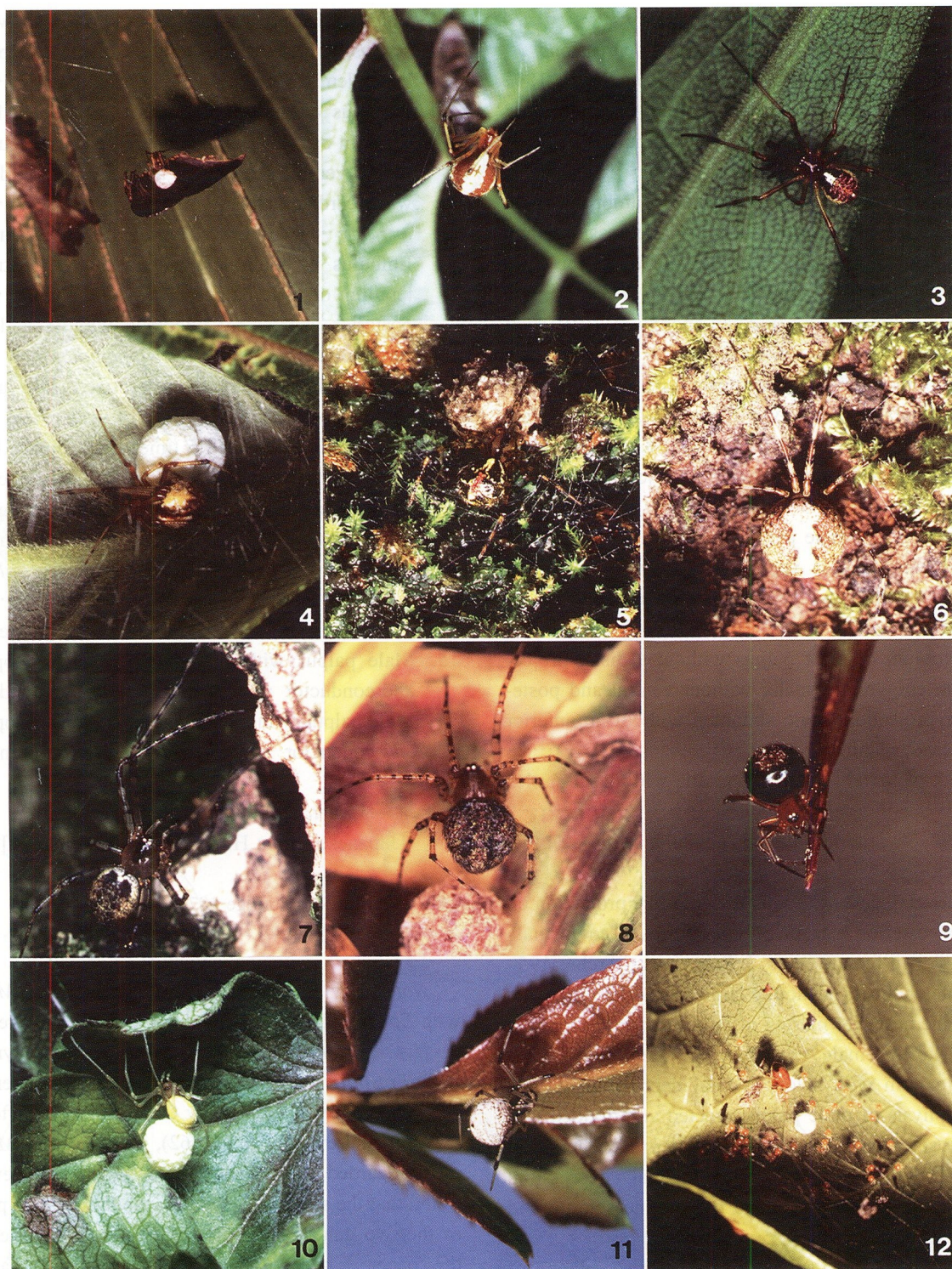
Many genera of Theridiidae belong to this subfamily, and a total of 16 genera, *Anelosimus*, *Chrosiothes*, *Moneta*, *Theridion*, *Nipponidion* new genus, *Takayus* new genus, *Nesticodes*, *Paidiscura*, *Keijia* new genus, *Rugathodes*, *Thymoites*, *Neottiura*, *Chrysso*, *Coleosoma*, *Achaearanea* and *Theridula*, are known as the members of this subfamily from Japan.

*Type genus.* *Theridion* Walckenaer 1805.

#### Key to the Japanese genera of the subfamily Theridiinae

1. Colulus small with two setae, or replaced by two setae .....2





**Figs. 1–12.** Females, 1, 12 from Okinawa Pref. (Photo: Hajime Yoshida), 2 from Nagano Pref., 3–9 from Aichi Pref. and 10 from Hokkaido (Photo: Kiyoto Ogata) and 11 from Nagano Pref. (Photo: Yasunosuke Chikuni) — 1, *Nipponidion yaeyamense* (Yoshida 1993) with an egg sac, 1-VIII-1978; 2, *Takayus takayensis* (S. Saito 1939), 9-VII-1985; 3, *Ta. chikunii* (Yaginuma 1960), 4-VII-1993; 4, *Ta. latifolius* (Yaginuma 1960) with an egg sac, 17-VI-1985; 5, *Ta. yunohamensis* (Bösenberg & Strand 1906), 29-VI-1991; 6, *Ta. subadultus* (Bösenberg & Strand 1906), 28-V-1985; 7, *Keijia sterninotata* (Bösenberg & Strand 1906), 10-V-2001; 8, *K. mneon* (Bösenberg & Strand 1906), 17-VI-1994; 9, *Paidiscura subpallens* (Bösenberg & Strand 1906), 16-VI-1992; 10, *Neottiura bimaculata* (Linnaeus 1767) with an egg sac, 7-VIII-1986; 11, *N. margarita* (Yoshida 1985), 13-VII-1984; 12, *Chrysso albipes* (S. Saito 1935) with juveniles and an egg sac unhatched, 2-VIII-1982.



- Colulus completely absent .....4
- 2. Abdomen oval without humps and depressions .....*Anelosimus* Simon 1891
- Abdomen with humps or depressions .....3
- 3. Abdomen with a pair of longitudinal depressions and a pair of lateral projections .....*Moneta* O. Pickard-Cambridge 1870
- Abdomen without longitudinal depressions and with dorsal humps .....*Chrosiothes* Simon 1894
- 4. Male palpus with median apophysis .....5
- Male palpus without median apophysis .....15
- 5. Abdomen oval or spherical .....6
- Abdomen with lateral or posterior projection .....14
- 6. Male carapace usually with projections; small, less than 2 mm .....*Thymoites* Keyserling 1884
- Male carapace usually without projections; usually more than 2 mm .....7
- 7. Cymbium of male palpus with a distal projection; epigynum with a ventral or posterior projection; male abdomen with an anterior sclerotized ring .....*Neottiura* Menge 1868
- Cymbium of male palpus without a distal projection; epigynum usually without ventral and posterior projection; male abdomen without an anterior sclerotized ring .....8
- 8. Duct of female internal genitalia with basal circles .....9
- Duct of female internal genitalia without basal circles .....10
- 9. Male chelicera with a large spine-like projection on the posterior margin of fang furrow; leg formula 1,4,2,3 in female .....*Rugathodes* Archer 1950
- Male chelicera without a large spine-like projection on the posterior margin of fang furrow; leg formula 1,2,4,3 in female .....*Keijia* new genus
- 10. Epigynum with a longitudinal depression; tegular apophysis of male palpus erected and divided into two sclerite .....*Paidiscura* Archer 1950
- Epigynum without a longitudinal depression; tegular apophysis of male palpus one sclerite and not erected .....11
- 11. Epigynum with a spherical projection; conductor of male palpus nearly as high as wide .....*Nesticodes* Archer 1950
- Epigynum without a spherical projection; conductor of male palpus higher than wide .....12
- 12. Epigynum without depression, and with a small scapus; conductor of male palpus connecting with large tegulum; abdomen usually blight with a dorsal feather-like dark fleck .....*Takayus* new genus
- Epigynum with depression, and usually without scapus; conductor and tegulum of male palpus independent sclerites; abdomen usually dark .....13
- 13. Embolus of male left palpus thin and clockwise; tegulum of male palpus globular; epigynum usually with a ventral depression; abdomen with a distinct wavy cardiac pattern .....*Theridion* Walckenaer 1805
- Embolus of male left palpus thin and straight; tegulum of male palpus concave; epigynum with a posterior depression; abdomen without a distinct cardiac pattern .....*Nipponidion* new genus
- 14. Male abdomen with a sclerotized ring around pedicel covering anterior half of venter; legs short, first patella and tibia 1.5 times the carapace length .....*Coleosoma* O. Pickard-Cambridge 1882
- Male abdomen without a sclerotized ring around pedicel; legs long, first patella and tibia usually more than 2.5 times the carapace length (*C. albipes*, 1.4 to 1.7 times) .....*Chrysso* O. Pickard-Cambridge 1882
- 15. Male palpus with subtegulum, tegular apophysis and conductor .....*Achaearana* Strand 1929
- Male palpus without subtegulum, tegular apophysis and conductor .....*Theridula* Emerton 1882

*Moneta* O. Pickard-Cambridge 1870

[Japanese name: Hime-hishigatagumo zoku]

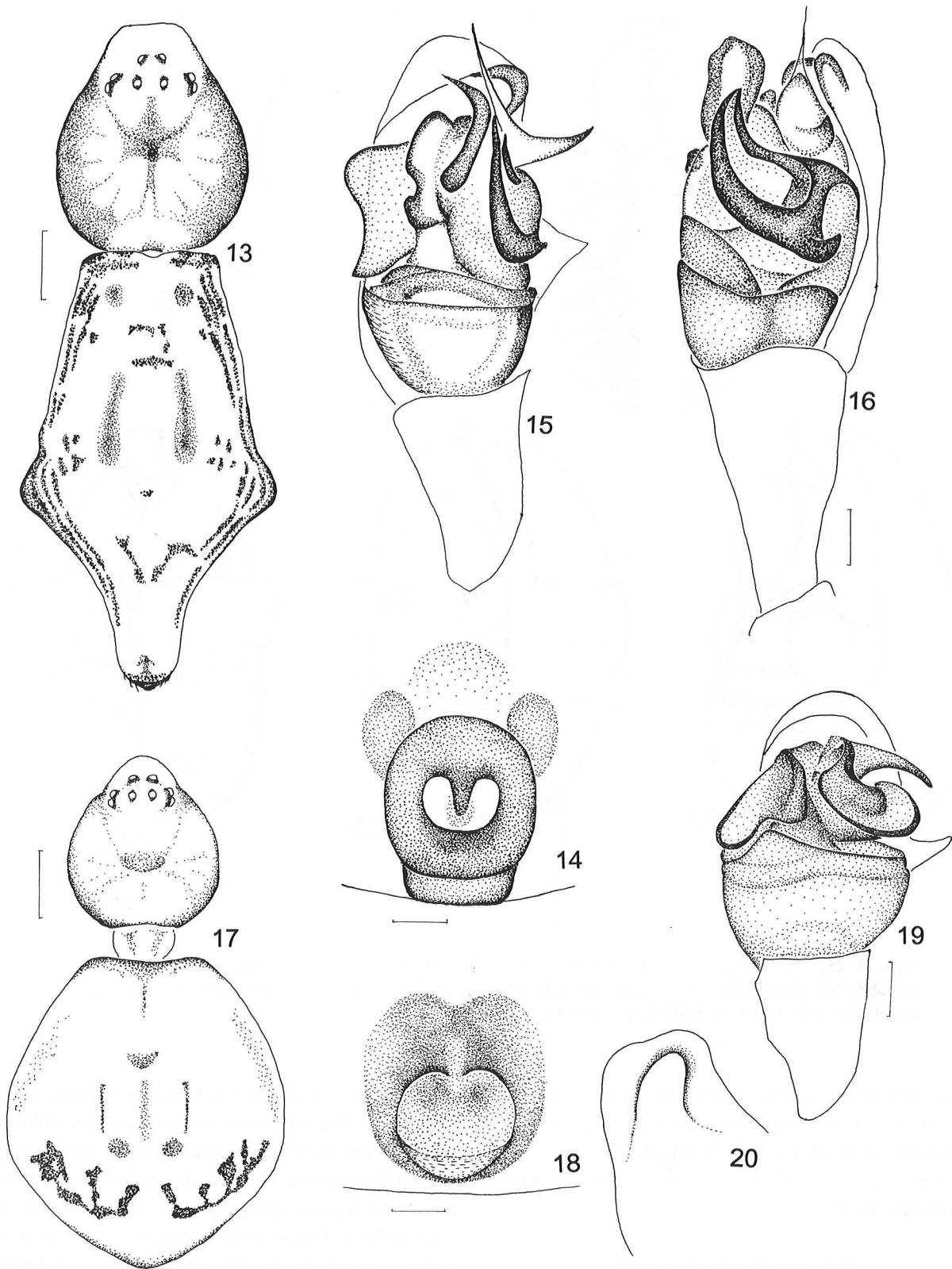
*Moneta* Pickard-Cambridge 1870, p. 736.

*Hyptimorpha* Strand, in Bösenberg & Strand 1906, p. 135.

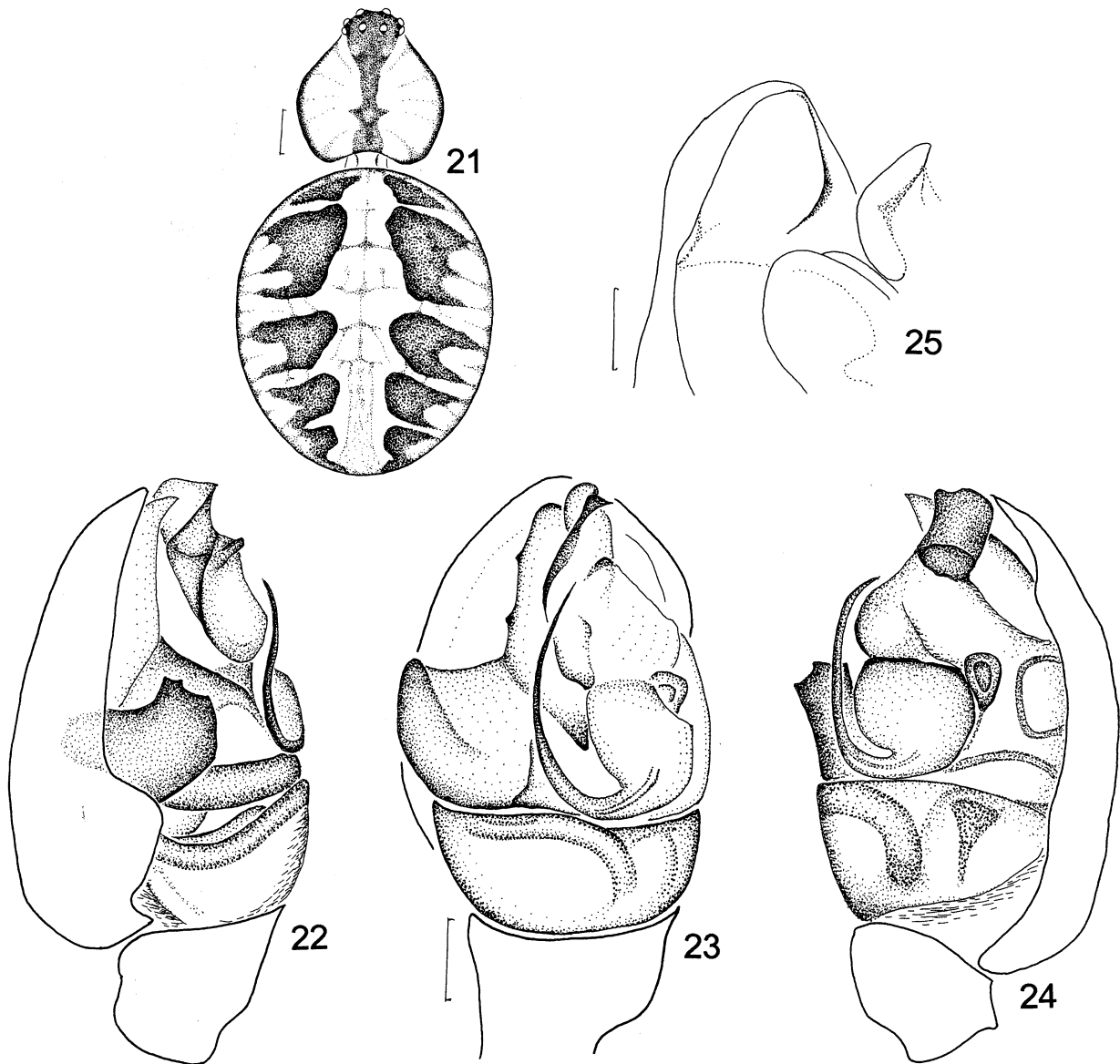
*Notes.* Levi & Levi (1962) had synonymized *Moneta* with *Episinus* Latreille 1809, but Okuma (1994) revived it. *Hyptimorpha* Strand 1906 had been synonymized with *Episinus* by Levi & Levi (1962), but later was synonymized with *Moneta* by Okuma (1994). After the revision of Levi & Levi (1962), *Episinus* and *Moneta* were regarded as closely related genera. However, I found that the structures of paracymbium of male palpus of the two genera are quite different between them. In this paper, I make *Episinus* belong to Episininae (by having hooked paracymbium) and *Moneta* to Theridiinae (hooded one).

In Japan, three species are known: *Moneta mirabilis* (Bösenberg & Strand 1906), *M. caudifer* (Dönitz & Strand 1906) and *M. tanikawai* (Yoshida 1991). *M. mirabilis* and *M. caudifer* are illustrated in Figs. 13–20. Abdomen flattened with a pair of longitudinal depressions and a pair of lateral projections (Figs. 13, 17).





**Figs. 13–20.** *Moneta mirabilis* (Bösenberg & Strand 1906) (13–16), ♀♂ from Taichung County, Taiwan (KMNH), and *M. caudifer* (Dönitz & Strand 1906) (17–20), ♀♂ from Mt. Iwawaki, Osaka Pref. —13, 17, female carapace and abdomen, dorsal view; 14, 18, epigynum, ventral view; 15–16, 19–20, male left palpus, ventral (15, 19), retrolateral (16) and inner view (cymbium) (20). Scales: 0.5 mm (13, 17) and 0.1 mm (14–16, 18–20).



**Figs. 21–25.** *Theridion pictum* (Walckenaer 1802), ♀♂ from Kamishihoro-cho, Hokkaido—21, female carapace and abdomen, dorsal view; 22–25, male left palpus, prolateral (22), ventral (23), retrolateral (24) and inner views (cymbium) (25). Scales: 0.5 mm (21) and 0.1 mm (22–25).

Epigynum with a large depression (Figs. 14, 18). Cymbium of male palpus with a retrolateral projection; paracymbium hooded (Figs. 15–16, 19–20).

*Type species.* *Moneta spinigera* O. Pickard-Cambridge 1870.

*Theridion* Walckenaer 1805  
[Japanese name: Himegumo zoku]

*Theridion* Walckenaer 1805, p. 72.

*Notes.* Type species of this genus, *Theridion pictum*

(Walckenaer 1802), has hooded paracymbium of male palpus (Fig. 26). This genus is also characterized by having abdomen with wavy cardiac pattern (Fig. 21) and male palpus usually with circular embolus and laterally projecting tegular apophysis (Fig. 22–24). *Th. pictum* also has large depression of epigynum and a pair of oval seminal receptacles. In this genus 24 species have been known from Japan (Tanikawa 2000). However, of these following 14 species are not true members of this genus: *Theridion yaeyamense* Yoshida 1993, *Th. takayense* S. Saito 1939, *Th. chikunii* Yaginuma 1960, *Th. latifolium* Yaginuma 1960, *Th. yunohamense* Bösenberg & Strand



1906, *Th. subadultum* Bösenberg & Strand 1906, *Th. lyricum* Walckenaer 1842, *Th. rufipes* Lucas 1846, *Th. subpallens* Bösenberg & Strand 1906, *Th. sterninotatum* Bösenberg & Strand 1906, *Th. mneon* Bösenberg & Strand 1906, *Th. nigrolimbatus* Yaginuma 1972, *Th. bimaculatum* (Linnaeus 1767) and *Th. riparium* Blackwall 1834. Eleven of them are newly transferred to other genera in this paper and remaining three have already been treated as other genera. In addition to them, one species, *Th. adamsoni* Berland 1934, is newly synonymized with *Th. mneon*.

Three species names, *Theridion argyrodiforme* Bösenberg & Strand 1906, *Th. indicis* Bösenberg & Strand 1906 and *Th. sagaphilum* Strand 1916, are treated as *nomina dubia*, because they seem not to belong to *Theridion* judging from the original description and no specimen of them has been available for Japanese arachnologists since the original description. Though two species, *Th. tinctum* Walckenaer 1802 and *Th. betteni* Wiehle 1960, have been recorded from Japan (Karsch 1879; Yaginuma 1970), I regard that these records were due to misidentifications.

Thus, at present, only four species, *Th. pictum* (Walckenaer 1802), *Th. pinastri* L. Koch 1872, *Th. melanostictum* O. Pickard-Cambridge 1876 and *Th. nojimai* Yoshida 1999, are recorded from Japan.

*Type species. Aranea picta* Walckenaer 1802.

#### *Nipponidion* new genus

[Japanese name: Okinawa-himegumo zoku]

*Diagnosis.* This genus resembles *Theridion* and *Takayus* new genus, but is distinguished from them by the male palpus with concaved tegulum, and erected embolus and conductor.

*Description.* Carapace oval. Abdomen spherical, with indistinct cardiac pattern (Fig. 26). Leg formula, 1,4,2,3 in female, 1,2,4,3 in male. Colulus absent. Epigynum projecting, with posterior depression; a pair of openings inside depression; seminal receptacles circular; ducts very short (Figs. 27–28). Male palpus with subtegulum, tegulum, tegular apophysis, median apophysis, conductor, embolus, cymbium and paracymbium: tegulum large and concave; embolus and conductor erected straightly and situated inside the concavity of tegulum; paracymbium hooded (Figs. 29–30).

*Notes.* This genus consists of the type species and *N. yaeyamense* (Yoshida 1993) new combination.

*Etymology.* The generic name is a contraction of Nipponese *Theridion*, and is neuter in gender.

*Type species. Nipponidion okinawense* new species.

#### *Nipponidion okinawense* new species

[Japanese name: Okinawa-himegumo]

(Figs. 26–30)

*Diagnosis.* This species is similar to *Nipponidion yaeyamense* (Yoshida 1993) new combination described from the Yaeyama Islands (Ishigaki and Iriomote Islands), about 400 km southwest of Okinawa Island in general appearance, but is distinguished from the latter by having the two dorsal and one ventral blackish flecks around spinnerets and by genital organ. This new species is also characterized by the epigynum with a pair of indistinct openings and the conductor of male palpus with a hooked tip.

*Description.* Carapace oval. Abdomen spherical, slightly higher than long and than wide in female, slender, longer than wide and than high in male. Male palpus nearly as long as the carapace length. AME largest.

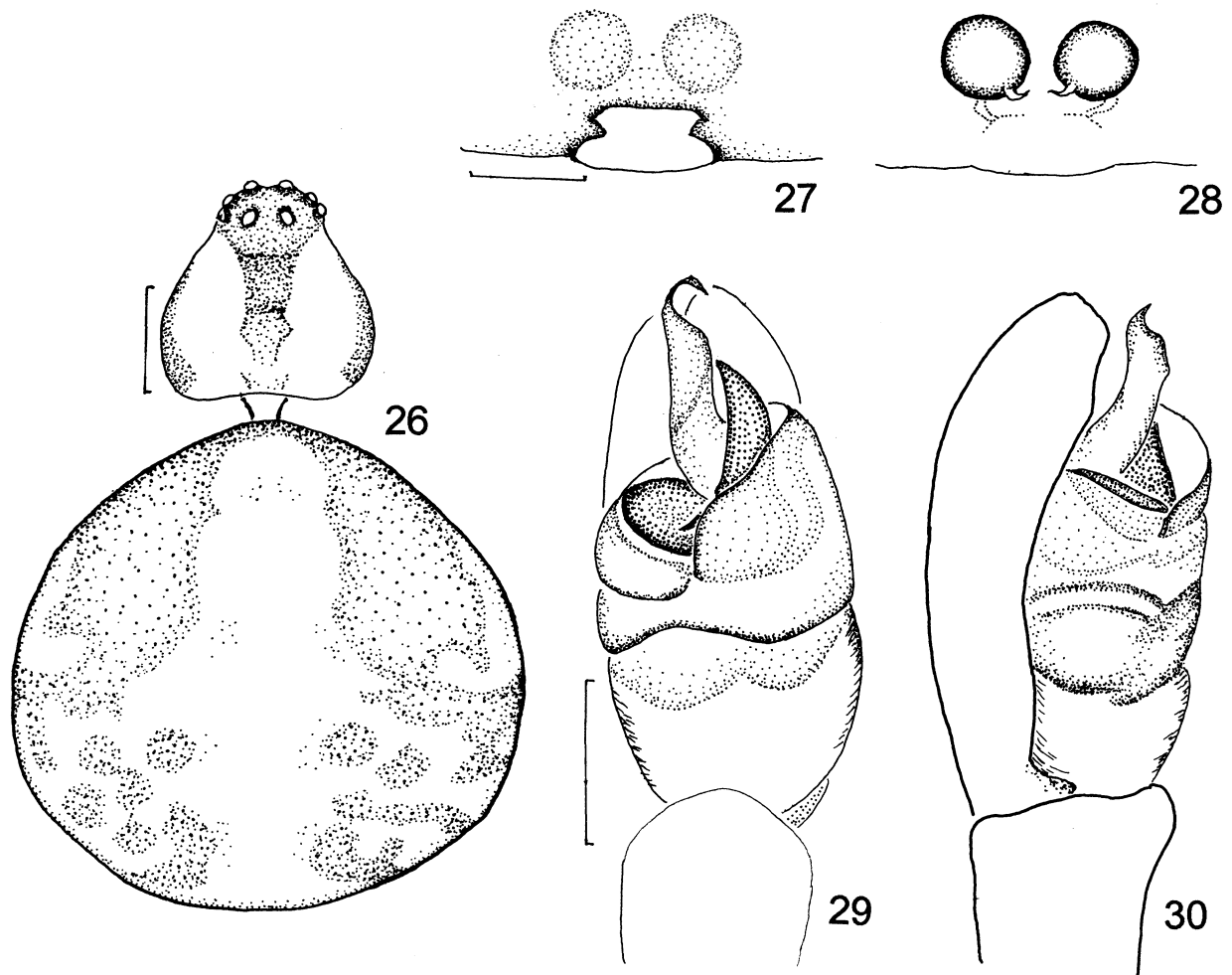
Female genital organ as shown in Figs. 27–28: epigynum with two indistinct openings within the posterior depression; duct short; seminal receptacles one pair and circular, situated near openings.

Palpal organ as shown in Figs. 29–30: conductor large, with a hooked tip; embolus thick, short and straight; tegulum large and concave, supporting the conductor and embolus; subtegulum large.

Coloration. Carapace brown with median and marginal dusky flecks. Chelicerae, maxillae and labium yellowish brown with dusky flecks. Sternum yellowish brown. Legs brown: femora, tibiae and metatarsi each distally with a blackish band; metatarsi basally with blackish flecks; patellae dusky. Abdomen grayish brown with blackish flecks and white pigments as shown in Fig. 26; venter with blackish flecks, one fleck anterior to the spinnerets and two flecks on both lateral sides of the epigynum.

Measurements (in mm. ♀ holotype/♂ allotype). Body length 3.32/2.47. Carapace length 1.05/1.16; width 0.95/0.95. Abdomen length 2.37/1.53; width 2.37/1.00; height 2.68/1.24. First leg: femur 2.16/2.21; patella and tibia 2.16/2.47; metatarsus 1.79/2.11; tarsus 0.79/0.74. Second patella and tibia 1.32/1.47; third patella and tibia 0.89/0.95; fourth patella and tibia 1.47/1.37. AME 0.12/0.12; ALE 0.08/0.08; PME 0.09/0.11; PLE 0.08/0.11. AME-AME 0.08/0.07; AME-ALE 0.03/0.04; PME-PME 0.07/0.05; PME-PL 0.08/0.08. MOA, AW 0.26/0.26; PW 0.21/0.24; L 0.24/0.21.

*Variation.* Body length 2.84 to 3.53 in female and



**Figs. 26–30.** *Nipponidion okinawense* new species, ♀ holotype and ♂ allotype—26, female carapace and abdomen, dorsal view; 27, epigynum, ventral view; 28, female internal genitalia, dorsal view; 29–30, male left palpus, ventral (29) and prolateral view (30). Scales: 0.5 mm (26) and 0.1 mm (27–30).

2.11 to 2.47 in male. Carapace length 1.05 to 1.18 in female and 0.97 to 1.16 in male. Abdomen length 1.67 to 2.37 in female and 1.26 to 1.53 in male. In dark specimens, carapace and sternum almost dusky.

*Type series.* Holotype: ♀, and allotype: ♂, Experiment Forest of the University of the Ryukyus, Yona, Kunigami-son, Kunigami-gun, 29-III-1997, (NSMT-Ar 4522–4523). Paratypes: 4♀, 2♂, same data as for the holotype (NSMT-Ar 4524); 1♀, 28-III-1997, same locality as for the holotype. All collected by A. Tanikawa from Okinawa Is., Okinawa Pref., Japan.

*Other specimens.* Okinawa Is.: 1♀, Yona, Kunigami-son, Kunigami-gun, 26-VI-1997, T. Sasaki leg.; 1♂, Oku-nosanso of the University of the Ryukyus, Oku, Kunigami-son, Kunigami-gun, 30-III-1997, T. Sasaki leg.; 4♀, Nakagusuku-son, Nakagani-gun, 23–25-VI-1995, A. Shinkai leg.

*Distribution.* Japan: Okinawa Is. of the Nansei Islands.

*Notes.* *Nipponidion yaeyamense* and this species are considered to be closest relatives one another and are probably vacariants.

*Etymology.* The specific name is an adjective derived from Okinawa Island.

*Nipponidion yaeyamense* (Yoshida 1993)

**new combination**

[Japanese name: Yaeyama-himegumo]

(Fig. 1)

*Theridion yaeyamense* Yoshida, 1993, p. 109, figs. 1–5 (holotype: ♀ from Iriomote-jima Island, Okinawa Prefecture, Japan, 29-III-1985, A. Tanikawa leg., NSMT-Ar 3073; examined).

*Distribution.* Japan: Ishigaki Is. and Iriomote Is. of



the Yaeyama Islands (Southern most island groups of the Nansei Islands).

**Biology.** Egg sac is white and built beneath a dead leaf hanging on the irregular web (Fig. 1).

***Takayus* new genus**

[Japanese name: Takayu-himegumo zoku]

**Diagnosis.** This genus resembles *Theridion*, but is distinguished from the latter by the following characteristics: epigynum with a small scapus; embolus of male palpus thick, not circulated; and conductor and large tegulum of male palpus forming one sclerite.

**Description.** Carapace oval. Abdomen usually bright color with a yellow to dark brown father-like fleck (Figs. 2–6). Leg formula, 1,4,2,3 in female, 1,2,4,3 in male. Colulus absent. Epigynum with a small scapus; a pair of openings situated anterior it; depression usually absent; atrium sclerotized (Figs. 32–32). Male palpus with subtegulum, tegulum, tegular apophysis, median apophysis, conductor, embolus, cymbium and paracymbium: embolus thick, not circulated; conductor and large tegulum forming one sclerite; tegular apophysis rounded; paracymbium hooded (Figs. 33–35).

**Notes.** *Theridion takayense* S. Saito 1939 is designated as a type species of this genus and is redescribed. Including this species, six Japanese of *Theridion* are transferred to this genus as presented below.

In addition to them, ten Chinese species are also newly transferred: *Takayus kunmingicus* (Zhu 1998) **new combination** = *Theridion kunmingicum* Zhu 1998, p. 136, fig. 80; *Ta. naevius* (Zhu 1998) **new combination** = *Th. naevium* Zhu 1998, p. 171, fig. 108; *Ta. lushanensis* (Zhu 1998) **new combination** = *Th. lushanense* Zhu 1998, p. 180, fig. 115; *Ta. xui* (Zhu 1998) **new combination** = *Th. xui* Zhu 1998, p. 181, fig. 116; *Ta. linimaculatus* (Zhu 1998) **new combination** = *Th. linimaculatum* Zhu 1998, p. 182, fig. 117; *Ta. wangi* (Zhu 1998) **new combination** = *Th. wangi* Zhu 1998, p. 183, fig. 118; *Ta. sublatifolius* (Zhu 1998) **new combination** = *Th. sublatifolium* Zhu, 1998, p. 192, fig. 125; *Ta. lunulatus* (Guan & Zhu 1993) **new combination** = *Th. lunulatum* Guan & Zhu, in Zhu et al. 1993, p. 91, figs. 11–13; *Ta. huanrenensis* (Zhu & Gao 1993) **new combination** = *Th. huanrense* Zhu & Gao, in Zhu et al. 1993, p. 90, figs. 5–10; and *Ta. quadrimaculatus* (Song & Kim 1991) **new combination** = *Th. quadrimaculatum* Song & Kim 1991, p. 20, figs. 4–6.

This genus can be divided into two species groups:

*Ta. takayensis* group includes three Japanese species,

*Ta. takayensis*, *Ta. chikunii* and *Ta. latifolius*. This group is characterized by light basal color, epigynum with a scapus, and male palpus with large embolus and tegular apophysis. All the Chinese species stated above also seem to belong to this group.

*Ta. yunohamensis* group consists of three species, *Ta. yunohamensis*, *Ta. subadultus* and *Ta. lyricus*. This group is characterized by dark basal color, small embolus and tegular apophysis of male palpus, and conductor overhangs them.

**Etymology.** The generic name is derived from Takayu Spa, and is masculine in gender.

**Type species.** *Theridion takayense* S. Saito 1939.

***Takayus takayensis* (S. Saito 1939) new combination**

[Japanese name: Takayu-himegumo]

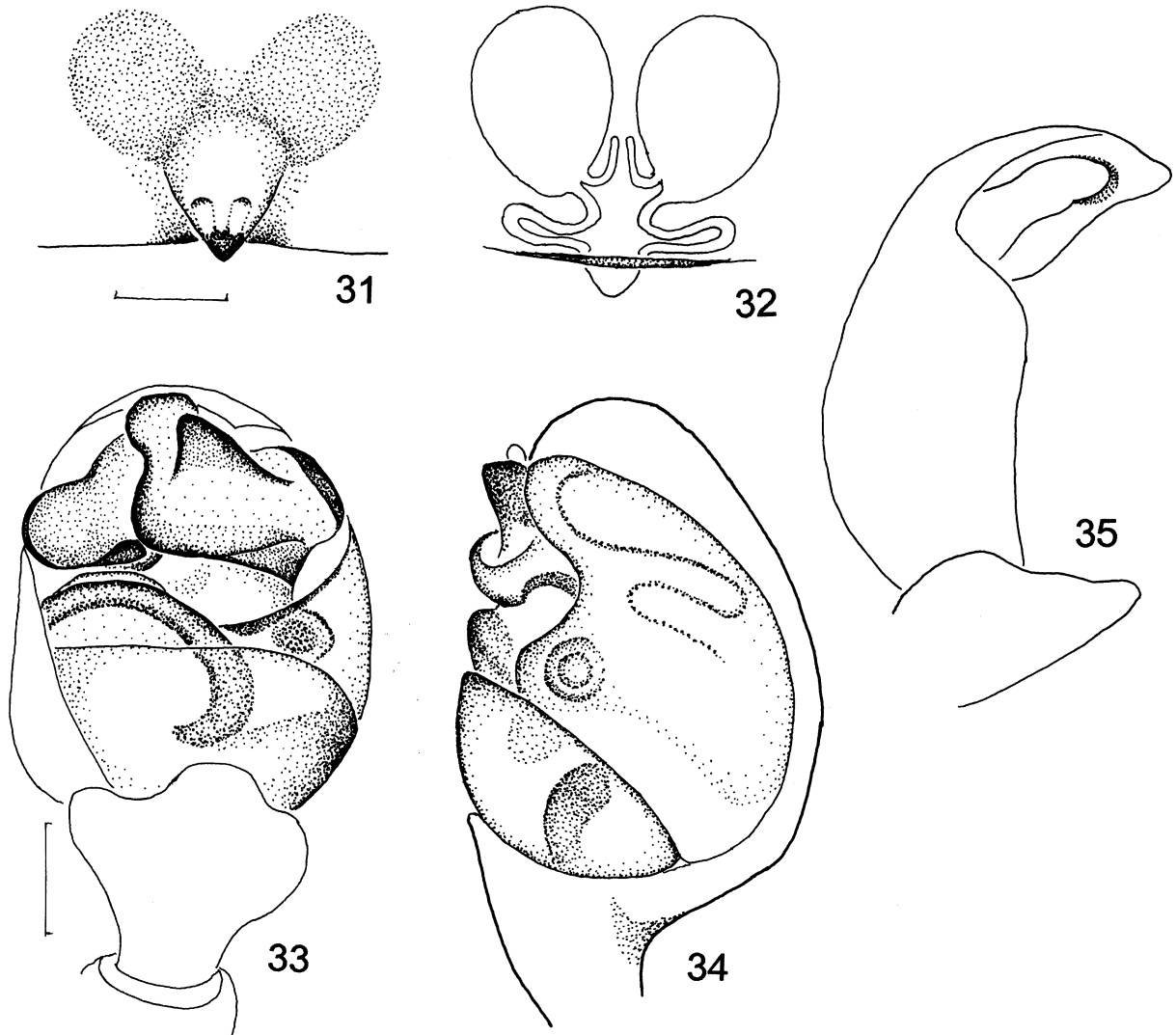
(Figs. 2, 31–35)

*Theridion takayense* Saito 1939, p. 47, pl. 1, fig. 19, text-fig. 6–2 (syntypes: 1♀ from Takayu, Yamagata Pref., Japan, 3-VII-1934, H. Kono leg. and 1♀ from Mt. Azuma, Yamagata Pref., 4-VII-1934, H. Kono leg., lost; neotype: ♀ designated in this paper)—Saito 1941, p. 192, fig. 225; Saito 1959, p. 72, pl. 9, fig. 70, pl. 10, fig. 70; Yaginuma 1960, p. 35, pl. 8, fig. 48; Yaginuma 1986, p. 35, pl. 8, fig. 1, text-fig. 19–9; Chikuni 1989, p. 41, fig. 54; Zhu 1998, p. 186, fig. 120; Song et al. 1999, p. 148, fig. 81A–B, I.

**Description.** Female genital organ as shown in Figs. 31–32: epigynum with a small scapus, openings situated in middle part of the scapus; seminal receptacles oval; duct complicated. Male palpus as shown in Figs. 33–35: embolus with a large and oval base, and small tip; conductor and tegulum forming one sclerite; tip of conductor round; tegular apophysis round.

**Coloration** (Fig. 2). Carapace brown medially with a faint dark fleck. Legs brown, distal part of tibiae dark. Abdomen dorsally with yellowish brown flecks, two pairs of posterior black spots and lateral white pigments; spinnerets surrounded with one anterior and two posterior black spots.

**Measurements** (in mm. ♀ neotype/♂ Higashine-shi, Yamagata Pref. NSMT-Ar 5161). Body length 3.84/2.58. Carapace length 1.32/1.00; width 1.11/0.95. Abdomen length 2.79/1.53; width 2.53/1.05; height 2.79/1.32. First leg: femur 2.84/2.47; patella and tibia 2.74/3.11; metatarsus 2.89/3.21; tarsus 0.74/0.79. Second patella and tibia 1.68/1.84; third patella and tibia 1.05/1.05; fourth patella and tibia 2.00/1.84. AME 0.08/0.08; ALE 0.09/0.08; PME 0.09/0.09; PLE



**Figs. 31–35.** *Takayus takayensis* (S. Saito 1939), ♀ from Yamagata-shi and ♂ from Higashine-shi, Yamagata Pref. —31, epigynum, ventral view; 32, female internal genitalia, dorsal view; 33–35, male left palpus, ventral (33), retrolateral (34) and inner view (cymbium) (35). Scale: 0.1 mm.

0.08/0.08. AME-AME 0.11/0.08; AME-ALE 0.03/0.05; PME-PME 0.08/0.08; PME-PLA 0.11/0.09. MOA, AW 0.26/0.24; PW 0.26/0.24; L 0.21/0.17.

**Variation.** Body length 3.00 to 4.00 in female and 2.50 to 3.00 in male.

**Type specimen.** Neotype: ♀, Zao Spa, Mt. Zao, Yamagata-shi, Yamagata Pref., Japan, 11-VIII-1976, H. Yoshida leg. (NSMT-Ar 5160).

**Distribution.** Japan: Hokkaido and Honshu. Korea and China.

**Notes.** Neotype is designated in this paper, because syntypes of this species are lost. Type localities of the species, Takayu and Mt. Azuma are plotted on the area where Zao Spa (=Takayu Spa) and Mt. Zao in Yamagata-shi, Yamagata Pref. located in a map of the original

description. However, these two geographic names probably represent Shirabu Spa (=Takayu Spa) or Shintakayu Spa, and Mt. Azuma in Yonezawa-shi, Yamagata Pref., since no geographic name that is called “Mt. Azuma” can be found in the Zao area of Yamagata Prefecture. However, I selected Zao Spa (Mt. Zao) as the type locality of the neotype, because no specimens from Mt. Azuma were available to me, and distance between the two areas (Mt. Zao and Mt. Azuma) is less than 40 km.

*Takayus chikunii* (Yaginuma 1960) **new combination**  
[Japanese name: Baragi-himegumo]  
(Fig. 3)

*Theridion chikunii* Yaginuma 1960, p. 36, appendage p. 1,



pl. 9, fig. 51, text-figs. 34(3–4), 101B (holotype: ♀ from Mt. Iwawaki-san, Osaka Prefecture, Japan, 31-V-1959, T. Yaginuma leg., in ASJ; examined)—Yaginuma 1986, p. 35, pl. 8, fig. 2, text-fig. 19–10; Chikuni 1989, p. 41, fig. 52; Zhu 1998, p. 185, fig. 119; Song et al. 1999, p. 137, fig. 72E–F, Q–R.

*Distribution.* Japan: Hokkaido, Honshu, Shikoku and Kyushu. Korea and China.

*Takayus latifolius* (Yaginuma 1960) **new combination**  
[Japanese name: Hiroha-himegumo]  
(Fig. 4)

*Theridion latifolium* Yaginuma 1960, p. 36, appendage p. 1, pl. 9, fig. 50, text-figs. 34(1–2), 101A (holotype: ♀ from Mt. Iwawaki, Osaka Prefecture, Japan, 3-V-1958, T. Yaginuma leg., in ASJ; examined)—Yaginuma 1986, p. 35, pl. 8, fig. 3, text-fig. 19–11; Chikuni 1989, p. 41, fig. 53; Zhu 1998, p. 152, fig. 93; Song et al. 1999, p. 138, fig. 74G–H, O–P, pl. 2F.

*Distribution.* Japan: Honshu, Shikoku and Kyushu. Korea and China.

*Takayus yunohamensis* (Bösenberg & Strand 1906)  
**new combination**  
[Japanese name: Yunohama-himegumo]  
(Fig. 5)

*Theridium yunohamense* Bösenberg & Strand 1906, p. 145, pl. 10, fig. 185 (holotype: ♀ from Yunohama, Saga, Japan, in SMF; not examined).

*Theridion yunohamense*: Saito 1941, p. 194, fig. 228; Yaginuma 1960, p. 37, pl. 10, fig. 58, text-fig. 35; Yaginuma 1986, p. 35, pl. 8, fig. 8, text-fig. 20–4; Chikuni 1989, p. 42, fig. 57.

*Distribution.* Japan: Hokkaido, Honshu, Shikoku and Kyushu.

*Takayus subadultus* (Bösenberg & Strand 1906)  
**new combination**  
[Japanese name: Koke-himegumo]  
(Fig. 6)

*Theridium subadultum* Bösenberg & Strand 1906, p. 147, pl. 5, fig. 42 (holotype: ♀ from Saga, Japan, 28-X-1883, D. Önitz leg., in SMF; not examined).

*Theridion subadultum*: Saito 1941, p. 190, fig. 224; Yaginuma 1960, p. 37, pl. 10, fig. 61; Yaginuma 1986, p. 35, pl. 8, fig. 4, text-fig. 19–12; Chikuni 1989, p. 44, fig. 63.

*Distribution.* Japan: Hokkaido, Honshu, Shikoku and Kyushu.

*Takayus lyricus* (Walckenaer 1842) **new combination**  
[Japanese name: Shimofuri-himegumo]

*Theridion lyricum* Walckenaer 1842, p. 288 (holotype: ♀ from Georgia, U. S. A; not examined)—Yoshida 1987, p. 13, figs. 1–2; Chikuni 1989, p. 44, fig. 63.

*Distribution.* Japan: Honshu, Kyushu and Iriomote Is. of the Nansei Islands. North America.

*Notes.* This species was originally described from North America, but is widely distributed also in Japan.

*Nesticodes* Archer 1950  
[Japanese name: Akaashi-himegumo zoku]

*Nesticodes* Archer 1950, p. 22; Wunderlich 1987, p. 214; Zhu 1998, p. 117.

*Description.* Epigynum with a spherical sclerotized plate; a pair of openings situated anterior part of the plate (Figs. 36–38). Conductor of male palpus large, nearly as high as wide, and has two basal spurs; embolus forming a stout tube; median apophysis situated behind embolus (Figs. 39). All coxae of male legs distally with a retrolateral cone.

*Notes.* Archer (1950) established the genus *Nesticodes*, which has widely been used after the revision made by Wunderlich (1987). This genus resembles *Theridion*, but is distinguished from the latter by the epigynum with a spherical plate, conductor of male palpus nearly as high as wide and the abdomen without distinct cardiac pattern.

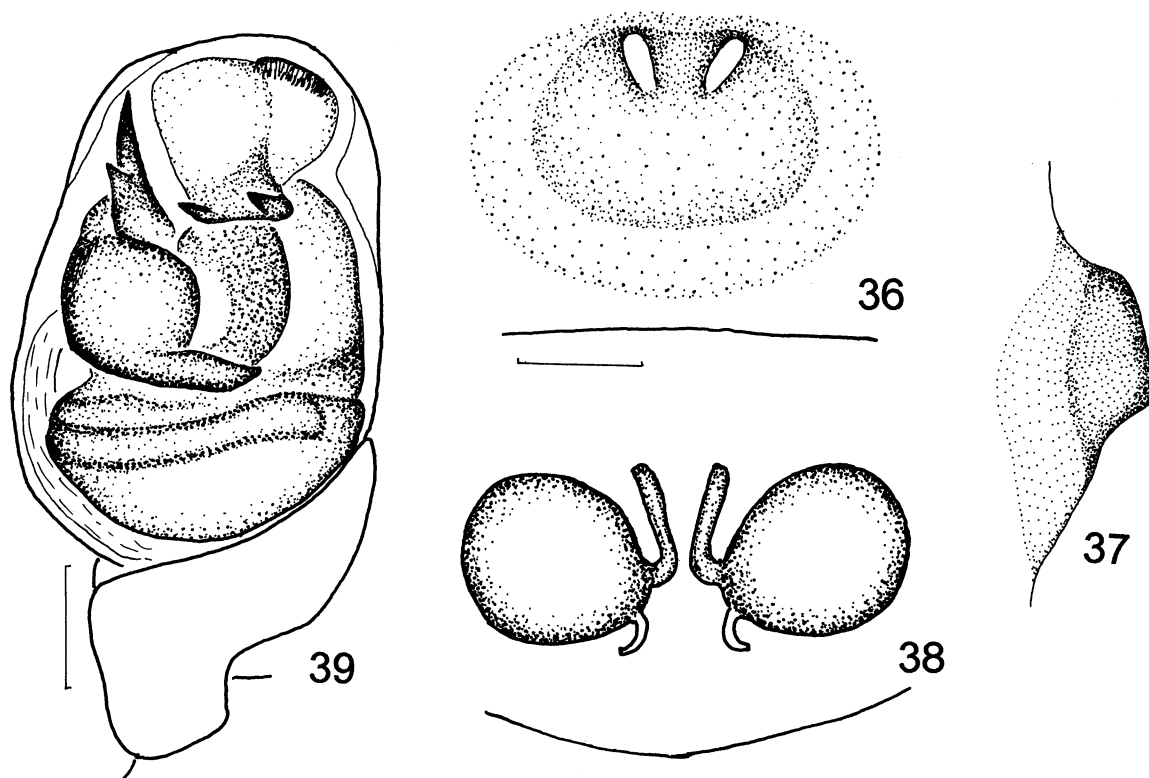
*Type species.* *Theridion rufipes* Lucas 1846.

*Nesticodes rufipes* (Lucas 1846)  
[Japanese name: Akaashi-himegumo]  
(Figs. 36–39)

*Theridion rufipes* Lucas 1846, p. 263, pl. 16, fig. 5; Tanikawa 1991, p. 2, figs. 1–5.

*Nesticodes rufipes*: Archer 1950, p. 22, pl. 3, figs. 7–8; Zhu 1998, p. 117, fig. 71; Song et al. 1999, p. 127, fig. 65N–Q.

*Specimens examined.* 1♀, Naze, Amami-oshima Is., Kagoshima Pref., 27-VII-1995, T. Irie leg.; 1♀, Minamidaito Is., Okinawa Pref., 11-X-1995, T. Irie leg.; 1♀, 29-III-1983, 1♂, 19-VIII-1985, Iriomote Is., Okinawa Pref., A. Tanikawa leg.



**Figs. 36–39.** *Nesticodes rufipes* (Lucas 1846), ♀♂ from Iriomote Is., Okinawa Pref. —36–37, epigynum, ventral view (36) and lateral view (37); 38, female internal genitalia, dorsal view; 39, male left palpus, ventral view. Scales: 0.1 mm

**Distribution.** Japan: Amami-oshima Is., Minami-daito Is. and Iriomote Is. of the Nansei Islands. Widely distributed in tropical area of the world.

**Notes.** This species is the type species and the only member of this genus. In Japan, Tanikawa (1991) recorded this species for the first time from Iriomote Is., the Nansei Islands. This species is distributed in the tropical area of the world and lives in the corner of artificial buildings. I examined some specimens collected on Amami-Oshima, Minami-daito and Iriomote Islands. They seem to be introduced.

*Paidiscura* Archer 1950

[Japanese name: Haiiro-himegumo zoku]

*Paidiscura* Archer 1950, p. 26; Wunderlich 1987, 215; Knoflach & Thaler, 2000, p. 423.

**Description.** Abdomen not sclerotized, without cardiac pattern and distinct flecks (Fig. 9). Epigynum with longitudinal oval depression (Fig. 40). Tegular apophysis of male palpus erected, divided distally; embolus with a small base, and a thin and long tip (Fig. 42).

Palpal tibia distally wide; patella with a distal spine.

**Notes.** This genus had been synonymized with *Theridion*, but later Wunderlich (1987) revived it. Knoflach & Thaler (2000) illustrated the paracymbium as a hook. However the tip of paracymbium attaches to cymbium, and the paracymbium forms a hood. Therefore, I treat this genus as Theridiinae.

This genus resembles *Theridion*, but is distinguished from the latter by tegular apophysis of male palpus erected, divided distally and epigynum with longitudinal oval depression, and the abdomen without distinct cardiac pattern. Some species have been known from Europe, and one Japanese species is newly transferred to this genus.

**Type species.** *Theridion pallens* Blackwall 1834.

*Paidiscura subpallens* (Bösenberg & Strand 1906)

**new combination**

[Japanese name: Haiiro-himegumo]

(Figs. 9, 40–42)

*Theridium subpallens* Bösenberg & Strand 1906, p. 139, pl. 12, fig. 293 (holotype: ♀ from Saga?, Japan, in SMF; not



examined).

*Theridion subpallens*: Saito 1941, p. 191, fig. 223; Yaginuma 1986, p. 38; Yoshida 1988, p. 25; Chikuni 1989, p. 44, fig. 65; Song et al. 1999, p. 142, fig. 77A–B, I–J; Yoshida & Ono 2000, p. 154, figs. 57–58.

*Dipoena caninotata* Bösenberg & Strand 1906, p. 150, pl. 12, fig. 266 (syntypes: 1♀1♂ from Saga, Japan, W. Dönitz leg., SMF 3068; examined).

*Theridion mirabilis* Zhu et al. 1991, p. 176, figs. 17–21 (holotype: ♂ from Shijiazhuang City, Hebei Province, China, 3-V-1985, M. Zhu leg., in HEC; not examined).

*Theridion mirabile*: Zhu 1998, p. 189, fig. 122.

**Distribution.** Japan: Honshu, Shikoku and Kyushu. Korea and China.

**Notes.** Following characteristics clearly show that this species belongs to *Paidiscura*: tegular apophysis of male palpus is erected sclerite that is divided distally; embolus has small base, and a thin and long tip (Fig. 42); epigynum has longitudinal oval depression (Fig. 40). Ducts of female internal genitalia are connecting with each other at opening that is situated in anterior part of the depression (Figs. 40–41). Yoshida (1988) and Song et al. (1999) synonymized *Dipoena caninotata* and *Theridion mirabile* with this species, respectively.

#### *Keijia* new genus

[Japanese name: Hoshi-himegumo zoku]

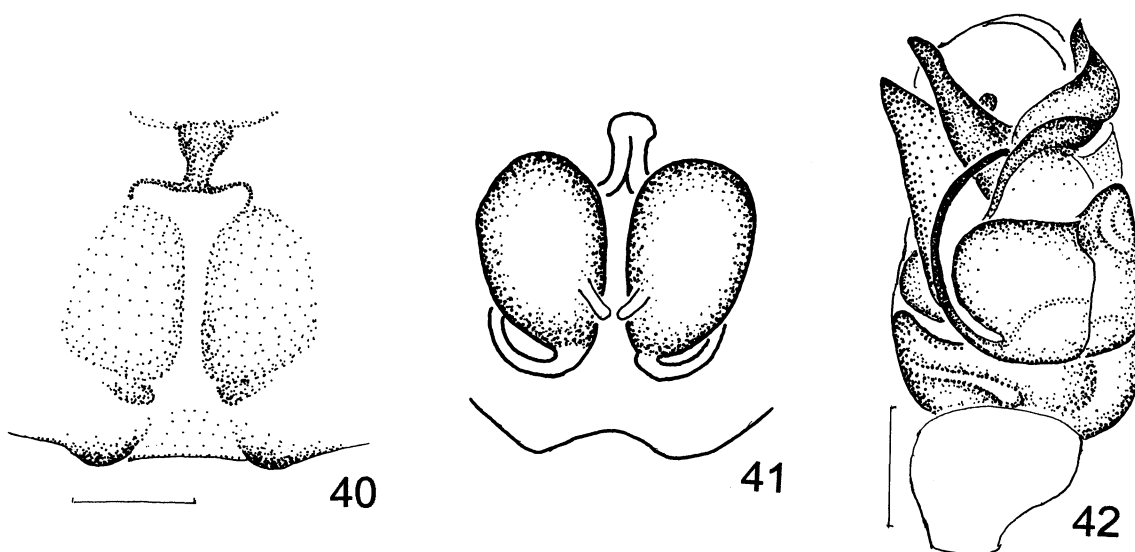
**Diagnosis.** This genus is easily distinguished from *Theridion* by the coloration of body and female leg for-

mula. It most resembles *Rugathodes*, but is distinguished from the latter by not having a large projection of male chelicera, having membranous conductor and thin embolus of male palpus, and black dotted coloration.

**Description.** Carapace oval. Abdomen spherical, brown with many black flecks and spots (Figs. 7–8, 43). Leg formula, 1,2,4,3 in both sexes. Epigynum with circular depression, openings situated inside the depression: duct of internal genitalia usually with circular base (Figs. 46–47, 50–51, 53–54). Male palpus with subtegulum, tegulum, tegular apophysis, median apophysis, conductor, embolus, cymbium and paracymbium: embolus thin and clockwise (left palpus); conductor large and membranous (Figs. 48–49, 52, 55).

**Notes.** Type species and two Japanese species belong to this genus. In addition to them, five species are newly transferred: *Keijia qionghaiensis* (Zhu 1998) **new combination** = *Theridion qionghaiense* Zhu 1998, p. 164, fig. 102, known from China; *K. tinctoria* (Walkenaer 1802) **new combination** = *Aranea tinctoria* Walkenaer 1802, p. 208, known from Europe and North America; *K. antonii* (Keyserling 1884) **new combination** = *Th. antonii* Keyserling 1884, p. 54, pl. 2, fig. 31; *K. alabamensis* (Gertsch & Archer 1942) **new combination** = *Th. alabamense* Gertsch & Archer 1942, p. 4; and *K. punctosparsa* (Emerton 1882) **new combination** = *Th. punctosparsum* Emerton 1882, p. 12, pl. 1, fig. 6, last three known from North America.

**Etymology.** The generic name is dedicated to my fa-



**Figs. 40–42.** *Paidiscura subpallens* (Bösenberg & Strand 1906), ♀♂ from Chuka-son, Okayama Pref. —40, epigynum, ventral view; 41, female internal genitalia, dorsal view; 42, male left palpus, ventral view. Scales: 0.1 mm.

ther the late Keiji Yoshida who first introduced the arachnology to me, and is feminine in gender.

*Type species.* *Keijia maculata* new species

***Keijia maculata* new species**

[Japanese name: Minami-hoshi-himegumo]

(Figs. 43–49)

*Diagnosis.* This species resembles *Keijia sterninotata* (Bösenberg & Strand 1906) from main islands of Japan, *K. mneon* (Bösenberg & Strand 1906) known from temperate area of the world and *K. qionghaiensis* (Zhu 1998) described from Hainan Province, China, but is distinguished from them by the following genital characteristics: openings invisible from outside (Fig. 46); ducts straight (Fig. 47); conductor membranous; and embolus forming a half circle (Figs. 48–49).

*Description.* Carapace oval, eye region slightly elevated; median furrow oval. Leg formula, 1,2,4,3 in both sexes. Abdomen spherical, slightly longer than high in female; slender, longer than wide and than high in male.

Female genital organ as shown in Figs. 46–47: epigynum with a circular depression; genital openings in the depression, invisible from outside; ducts long and straight; seminal receptacles one pair and circular, situated anterior to the depression.

Palpal organ as shown in Figs. 48–49: conductor membranous, distally with a needle-like projection; embolus thick with small base, forming a half circle; median apophysis blackish brown and triangular, situated behind conductor; tegulum connecting to embolus and supporting conductor and median apophysis; subtegulum large.

Coloration. Carapace brown with a median wide and marginal thin dusky flecks; eye region black (Fig. 43). Chelicerae and maxillae yellowish brown. Labium dusky brown. Sternum brown with three pairs of lateral, a median and a posterior black flecks (Fig. 44). Legs yellowish brown with following black spots: femora with two ventral and one dorsal spots, and two distal rings; tibiae with basal and distal rings, and three (first and second) or one (third and fourth) ventral flecks; metatarsi with three wide rings (Fig. 45). Abdomen grayish brown, with dark flecks, and sparse hairs with black and sclerotized bases as shown in Fig. 43; venter with a large black fleck between spinnerets and epigynum, and black flecks around epigynum; a pair of wide black flecks on both sides of spinnerets and two small black spots anterior to spinnerets.

Measurements (in mm. ♀ holotype/♂ allotype). Body length 2.26/2.00. Carapace length 1.00/0.95; width 0.92/0.82. Abdomen length 1.34/1.05; width 1.34/1.05; height 1.18/1.05. First leg: femur 1.71/1.79; patella and tibia 1.79/1.79; metatarsus 1.26/1.32; tarsus 0.45/0.42. Second patella and tibia 1.50/1.78; third patella and tibia 0.87/0.82; fourth patella and tibia 1.03/0.92. AME 0.11/0.11; ALE 0.08/0.07; PME 0.08/0.08; PLE 0.08/0.07. AME-AME 0.09/0.08; AME-ALE 0.04/0.04; PME-PME 0.08/0.05; PME-PL 0.07/0.07. MOA, AW 0.26/0.26; PW 0.25/0.24; L 0.22/0.24.

*Variation.* Body length 1.92 to 2.26 in female and 2.00 to 2.11 in male. Carapace length 0.92 to 1.00 in female and 0.95 to 1.11 in male. Abdomen length 1.00 to 1.34 in female. In dark specimens, black flecks of sternum and legs are indistinct.

*Type series.* Holotype: ♀, Urauchi, 29-III-1989 (NSMT-Ar 5162). Allotype: ♂, Sonai, 16-III-1988 (NSMT-Ar 5163). Paratypes: 1♀, Otomi, 26-VIII-1987 (NSMT-Ar 5164); 1♂, 1-IV-1987, 1♀, 31-III-1989, Funaura, (CAT); 1♂, Shirahama, 2-I-1990. All collected by A. Tanikawa from Iriomote Is., Okinawa Pref., Japan.

*Other specimens.* 1♂ juvenile, 11-VII-1976, 1♀, 1-VIII-1978, Mt. Banna-dake, Ishigaki Is., Okinawa Pref., H. Yoshida leg.

*Distribution.* Japan: Ishigaki Is. and Iriomote Is. of the Yaeyama Islands (southern most island groups of the Nansei Islands).

*Etymology.* The specific name is a Latin adjective derived from the markings of legs, sternum and abdomen.

***Keijia sterninotata* (Bösenberg & Strand 1906)**

**new combination**

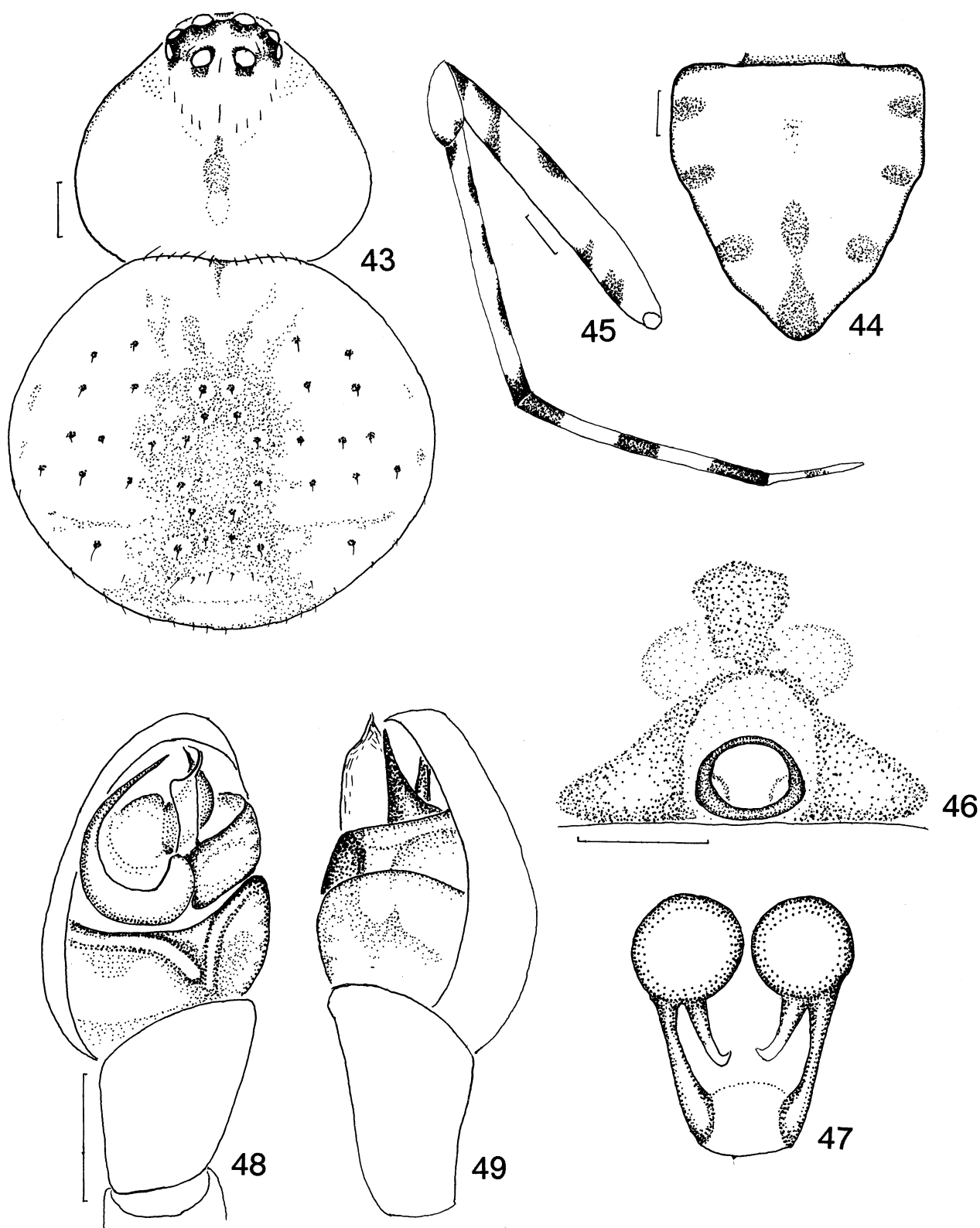
[Japanese name: Munaboshi-himegumo]

(Figs. 7, 50–52)

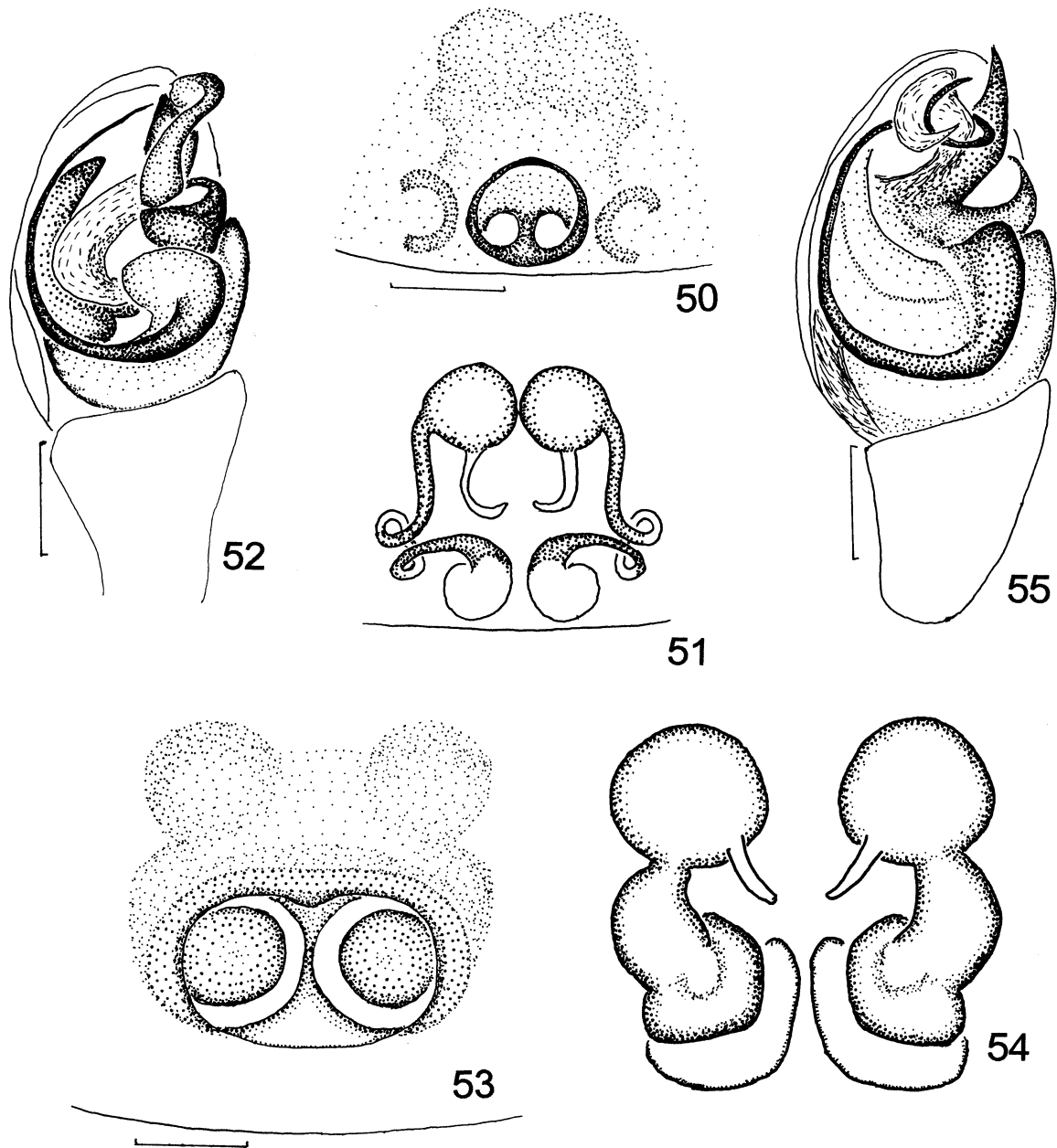
*Theridium sterninotatum* Bösenberg & Strand 1906, p. 143, pl. 12, fig. 290 (syntypes: ♀♂ from Saga, Japan, Dönitz leg., in SMF; not examined).

*Theridium sterninotatum*: Saito 1941, p. 189, fig. 221; Yaginuma 1960, p. 37, pl. 10, fig. 59, text-fig. 35; Yaginuma 1986, p. 35, pl. 8, fig. 7, text-fig. 20-3; Chikuni 1989, p. 43, fig. 60; Zhu 1998, p. 156, fig. 96; Song et al. 1999, p. 142, fig. 80C–D, K–L.

*Distribution.* Japan: Hokkaido, Honshu, Shikoku and Kyushu. Korea and China.



**Figs. 43–49.** *Keijia maculata* new species, ♀ holotype and ♂ allotype—43, female carapace and abdomen, dorsal view; 44, female sternum, ventral view; 45, female first left leg, retrolateral view; 46, epigynum, ventral view; 47, female internal genitalia, dorsal view; 48–49, male left palpus, ventral (48) and retrolateral view (49). Scales: 0.2 mm (43) and 0.1 mm (44–49).



**Figs. 50–55.** *Keijia sterninotata* (Bösenberg & Strand 1906) (50–52), ♀♂ from Mt. Iwawaki, Osaka Pref., and *K. mneon* (Bösenberg & Strand 1906) (53–55), ♀ from Shirahama, Wakayama Pref. and ♂ from Minami-daito Is., Okinawa Pref. —50, 50, epigynum, ventral view; 51, 54, female internal genitalia, dorsal view; 52, 55, male left palpus, ventral view. Scales: 0.1 mm

*Keijia mneon* (Bösenberg & Strand 1906)  
**new combination**  
 [Japanese name: Sato-himegumo]  
 (Figs. 8, 53–55)

*Theridium mneon* Bösenberg & Strand 1906, p. 142, pl. 12, fig. 286 (holotype: ♀ from Kompira, Saga, Japan, Dönitz leg., in SMF; not examined).

*Theridium mneon*: Saito 1941, p. 187, fig. 217.

*Theridium adamsoni* Berland 1934, p. 102, figs. 6–9; Kumada 1987, p. 1, figs. 1–8; Chikuni 1989, p. 43, fig. 61; Zhu 1998, p. 162, fig. 101; Song et al. 1999, p. 137, fig. 71G–H, M–N. **New Synonymy**

*Coleosoma adamsoni*: Saaristo 1978, p. 117, figs. 183–191.

**Distribution.** Japan: Southern part of Honshu, Shikoku, Kyushu, Minami-daito Is., Kita-daito Is. and

Iriomote Is. Widely distributed in the temperate and tropical area of the world.

*Notes.* Although *Theridion adamsoni* Berland 1934 has been known from Japan, China, North America, and temperate and tropical area of the world, I consider that *Th. mneon* Bösenberg & Strand 1906 described from Japan is conspecific to *Th. adamsoni*. Saaristo (1978) transferred this species to *Coleosoma*, but this transfer is not adequate.

*Rugathodes* Archer 1950

[Japanese name: Takane-himegumo zoku]

*Rugathodes* Archer 1950, p. 24; Wunderlich 1987, p. 213.

*Description.* Male chelicera with a large spine-like projection and a distal tooth on posterior margin of fang furrow (Fig. 59). Duct of female internal genitalia convoluted near the opening (Fig. 57). Conductor of male palpus thick and short sclerite, catching the curved embolus (Fig. 58). Abdomen spherical with variable flecks, without a distinct cardiac pattern. Legs relatively short.

*Notes.* This genus was originally described as a subgenus of *Theridion*. Levi & Levi (1962) doubted the subgeneric division, but Wunderlich (1987) raised it to generic status and I also treat *Rugathodes* as a valid genus. Until now, this genus has been known from

America and Europe. In this paper, a Japanese species is newly transferred to this genus.

This genus resembles *Theridion*, but is distinguished from the latter by the male chelicera with a large spine-like projection, the female internal genitalia with circulated duct near opening, and the indistinct and variable flecks of abdomen.

*Type species.* *Theridium sexpunctatum* Emerton 1882.

*Rugathodes nigrolimbata* (Yaginuma 1972)

**new combination**

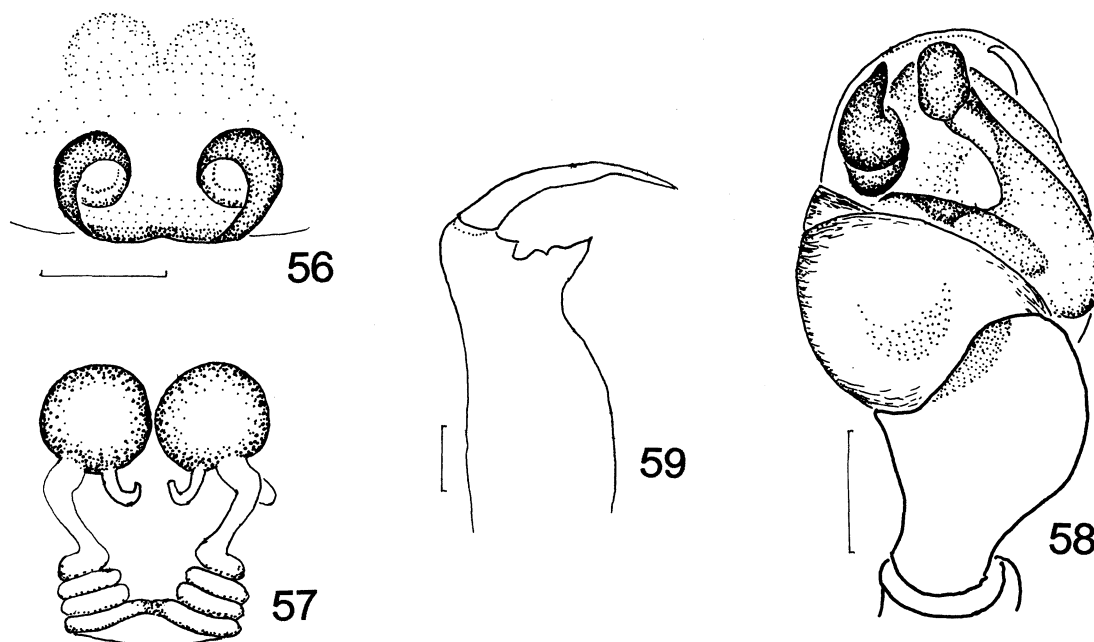
[Japanese name: Takane-himegumo]

(Figs. 56–59)

*Theridium nigrolimbata* Yaginuma 1972, p. 22, figs. 1–5 (holotype: ♀ from Mt. Poroshiri-dake, Hidaka, Hokkaido, Japan, 27-VII-1971, J. Aoki leg., NSMT-Ar 102; examined)—Yaginuma 1986, p. 37, text-fig. 20–6; Chikuni 1989, p. 45, fig. 66.

*Distribution.* Japan: Hokkaido, and northern and high altitudinal area of Honshu.

*Notes.* Following characteristics clearly show that this species belongs to *Rugathodes*: male chelicera with a large spine-like projection (Fig. 59); duct of female internal genitalia convoluted near opening (Fig. 57); con-



**Figs. 56–59.** *Rugathodes nigrolimbata* (Yaginuma 1972), ♀♂ from Yamanobe-machi, Yamagata Pref. —56, epigynum, ventral view; 57, female internal genitalia, dorsal view; 58, male left palpus, ventral view; 59, male left chelicera, anterior view. Scales: 0.1 mm.



ductor of male palpus thick and with a short sclerite (Fig. 58). Legs relatively short, first patella and tibia 1.5 times carapace length, epigynum with a pair of openings (Fig. 56), and abdomen with a variable coloration, characteristic of this genus.

*Neottiura* Menge 1868

[Japanese name: Chikuni-himegumo zoku]

*Neottiura* Menge 1868, p. 162; Archer 1950, p. 21; Knoflach 1999, p. 344.

**Description.** Carapace oval, longer than wide; eye region projecting. Chelicera with wide base and a small fang. Sternum slender. Legs relatively long; first patella and tibia 2 to 2.3 times carapace length. Abdomen spherical and having large white pigments in female (Figs. 10–11), slender and having black flecks in male. Colulus absent. Epigynum with a ventral or posterior projection (Figs. 60–61, 63). Male palpus with long femur, 0.6 to 1.3 mm; tip of cymbium with a distal projection; paracymbium hooded (Figs. 62, 65).

**Notes.** Although this genus had been synonymized with *Theridion*, recently it was resurrected as an independent genus (Knoflach 1999). Two Japanese species were already transferred to this genus by Knoflach (1999): *Neottiura bimaculata* (Linnaeus 1767) and *N. margarita* (Yoshida 1985).

**Type species.** *Aranea bimaculata* Linnaeus 1767.

*Neottiura bimaculata* (Linnaeus 1767)

[Japanese name: Futasuji-himegumo]

(Figs. 10, 60–62)

*Aranea bimaculata* Linnaeus 1767, p. 1033.

*Neottiura bimaculata*: Menge 1868, p. 162; Knoflach 1999, p. 350, figs. 1–5, 7, 10, 23–35, 44, 47, 50, 56, 64–65, 84.

*Theridion bimaculatum*: Yaginuma 1986, p. 38, text-fig. 20–7; Chikuni 1989, p. 43, fig. 59; Zhu 1998, p. 130, fig. 74; Song et al. 1999, p. 137, fig. 72A–B, O–P.

**Distribution.** Japan: Hokkaido. China and Europe.

*Neottiura margarita* (Yoshida 1985)

[Japanese name: Chikuni-himegumo]

(Figs. 11, 63–65)

*Coleosoma margaritum* Yoshida 1985, p. 45, figs. 1–6 (holotype: ♂ from Iwahara, Horigane-mura, Nagano Prefecture, Japan, 22–VI-1973, Y. Chikuni leg., in ASJ;

examined)—Yaginuma 1986, p. 48; Chikuni 1989, p. 33, fig. 19.

*Theridion margaritum*: Gao et al. 1993, p. 78, figs. 19–24; Zhu 1998, p. 177, fig. 113; Song et al. 1999, p. 138, fig. 76C–D, I–J.

*Neottiura margarita*: Knoflach 1999, p. 345.

**Specimens examined** (addition to type series). 1♂, 24–V-1995, 1♂, 10–V-1998, Hata, Soja-shi, Okayama Pref., K. Nojima leg.

**Distribution.** Japan: Honshu (Miyagi, Nagano and Okayama Prefectures). China.

**Notes.** This species was described by myself, but it was recently transferred to *Neottiura* by Knoflach (1999). In the original description, it was stated that 4 male paratypes were collected from Iwate Prefecture by mistake. Correctly the locality of them is Hosokura, Uguisuzawa-cho, Miyagi Pref.

*Chrysso* O. Pickard-Cambridge 1882

[Japanese name: Kogane-himegumo zoku]

*Chrysso* Pickard-Cambridge 1882, p. 429; Levi & Levi 1962, p. 46; Yaginuma 1986, p. 44; Zhu, 1998, p. 44.

*Meotipa* Simon 1894, p. 519; S. Saito 1941, p. 195; Yaginuma 1960, p. 34.

*Physcoa* Thorell 1895, p. 82.

*Argyria* Yaginuma 1957, p. 11.

*Argyroaster* Yaginuma 1958, p. 37; Yaginuma 1960, p. 38.

**Notes.** Structures of abdomen and genital organs are variable. Further generic revision may be needed.

*Chrysso scintillans* (Thorell 1895)

[Japanese name: Kogane-himegumo]

(Figs. 66–71)

*Physcoa scintillans* Thorell 1895, p. 83 (syntypes: 2♀ from Tharrawady, Burma, in BMNH; not examined).

*Chrysso scintillans*: Levi & Levi 1962, p. 46, figs. 114–117.

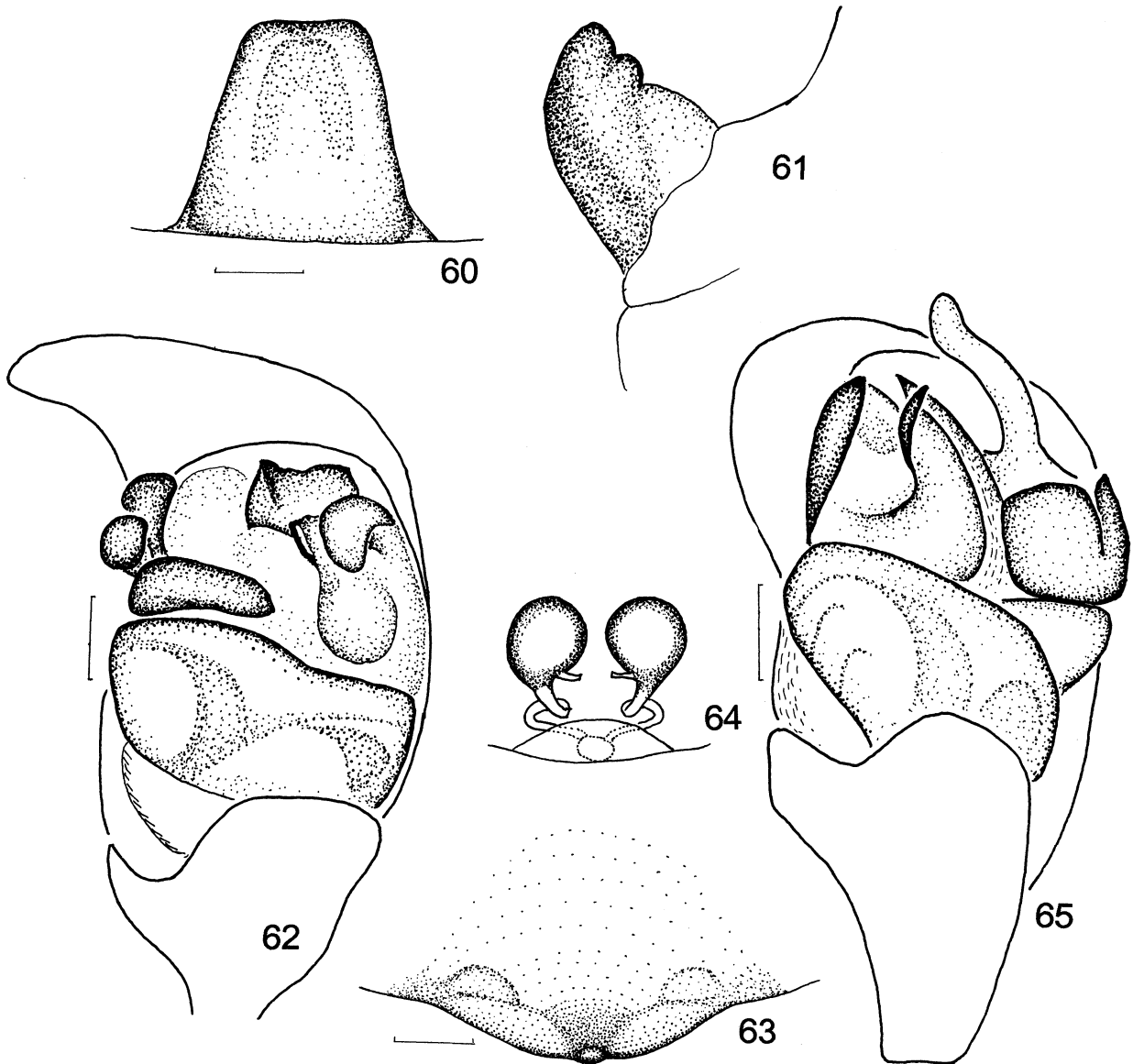
*Argyria venusta* Yaginuma 1957, p. 11, fig. 1 (holotype: ♀ from Mt. Iwawaki, Osaka Pref., Japan, 9–VIII-1955, T. Yaginuma leg., in OMNH; examined). **New Synonymy**

*Argyroaster venusta*: Yaginuma 1960, p. 38, pl. 10, fig. 62.

*Chrysso venusta*: Yaginuma 1965, p. 35; Yaginuma 1968, p. 38, pl. 10, fig. 62; Yaginuma 1986, p. 46, pl. 10, fig. 9, text-fig. 24–4; Chikuni 1989, p. 32, fig. 12; Yoshida 1993a, p. 33; Zhu 1998, p. 59, fig. 32; Song et al. 1999, p. 107, fig. 51C–D, K.

**Distribution.** Japan: Southern part of Honshu, Shikoku, Kyushu. China and Myanmar.

**Notes.** This species has been known as *Chrysso*



**Figs. 60–65.** *Neottiura bimaculata* (Linnaeus 1767) (60–62), ♀♂ from Rishiri Is., Hokkaido and *N. margarita* (Yoshida 1985) (63–65), ♀ from Horigane-mura, Nagano Pref. and ♂ from Uguisuzawa-cho, Miyagi Pref.—60–61, 63, epigynum, ventral (60, 63) and lateral view (61); 64, female internal genitalia, dorsal view; 62, 65, male left palpus, ventral view. Scales: 0.1 mm.

*venusta* (Yaginuma 1957) in Japan, but I recognized that *C. scintillans* (Thorell 1895) described from Myanmar is a senior synonym of *C. venusta*.

Abdomen with a pair of lateral and a posterior projections (Fig. 66). Female genital organs as shown in Figs. 67–68: epigynum with a large transverse depression. Male palpus as shown in Figs. 69–71: cymbium with a distal projection and a hooded paracymbium.

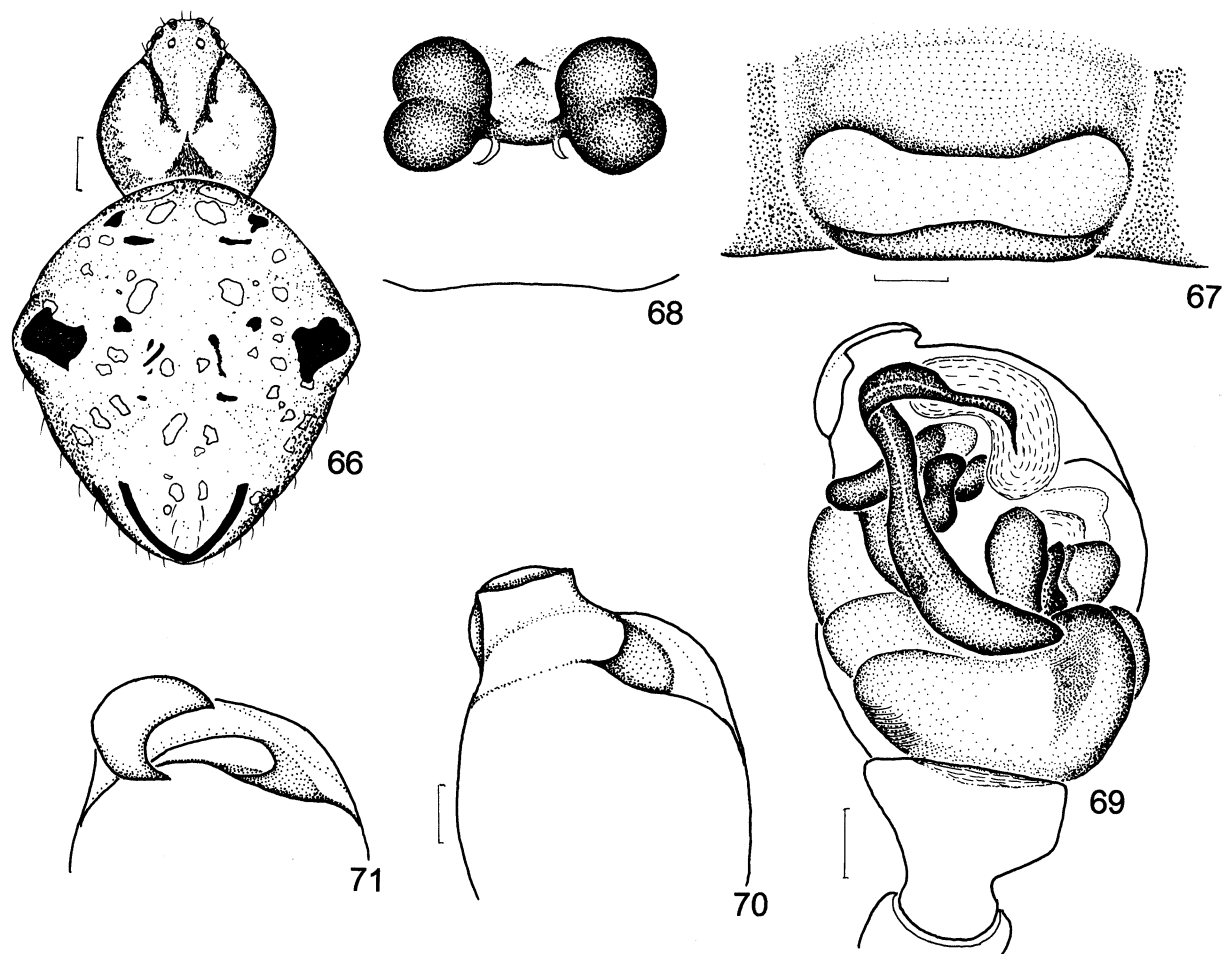
*Chrysso albipes* (S. Saito 1935) **new combination**

[Japanese name: Giboshi-himegumo]

(Figs. 12, 72–74)

*Theridula albipes* Saito 1935, p. 59, fig. 2 (holotype: ♀ from Kurashi, southern Sakhalin, Russia, 8-IV-1834, C. Watanabe leg., lost)—Saito 1941, p. 175, fig. 199.

*Theridion rapulum* Yaginuma 1960, p. 36, appendage p. 2, pl. 9, fig. 55, text-fig. 101C, I (holotype: ♀ from Mt. Bunagatake, Hira, Shiga Pref., Japan, 4-VIII-1954, T. Yaginuma leg., in ASJ; examined)—Yaginuma 1986, p. 35, pl. 8, fig. 5, text-fig. 20–5; Chikuni 1989, p. 42, fig.



**Figs. 66–71.** *Chrysso scintillans* (Thorell 1895), ♀♂ from Shingo-cho, Okayama Pref. —66, female carapace and abdomen, dorsal view; 67, epigynum, ventral view; 68, female internal genitalia, dorsal view; 69–71, male left palpus, ventral (69) and inner view (cymbium) (70–71). Scales: 0.5 mm (66) and 0.1 mm (67–71).

#### 58. New Synonymy

*Chrysso rapulum*: Yoshida 1993a, p. 32, fig. 21; Zhu, 1998, p. 57, fig. 30.

*Chrysso rapula*: Song et al. 1999, p. 107, fig. 50C–D, K.

**Distribution.** Widely distributed in Japan. China and Sakhalin (Russia).

**Notes.** This species has been known as *Chrysso rapula* (Yaginuma 1960), but *Theridula albipes* S. Saito 1935 described from Sakhalin is a senior synonym of *C. rapula*. Basal color reddish orange to blackish brown; abdomen with a pair of lateral black flecks (Fig. 12), sometimes almost black without flecks. Genital organs are illustrated in Figs. 72–74. This species has some different characteristics from those of this genus. A generic revision of this species will be made in the future study.

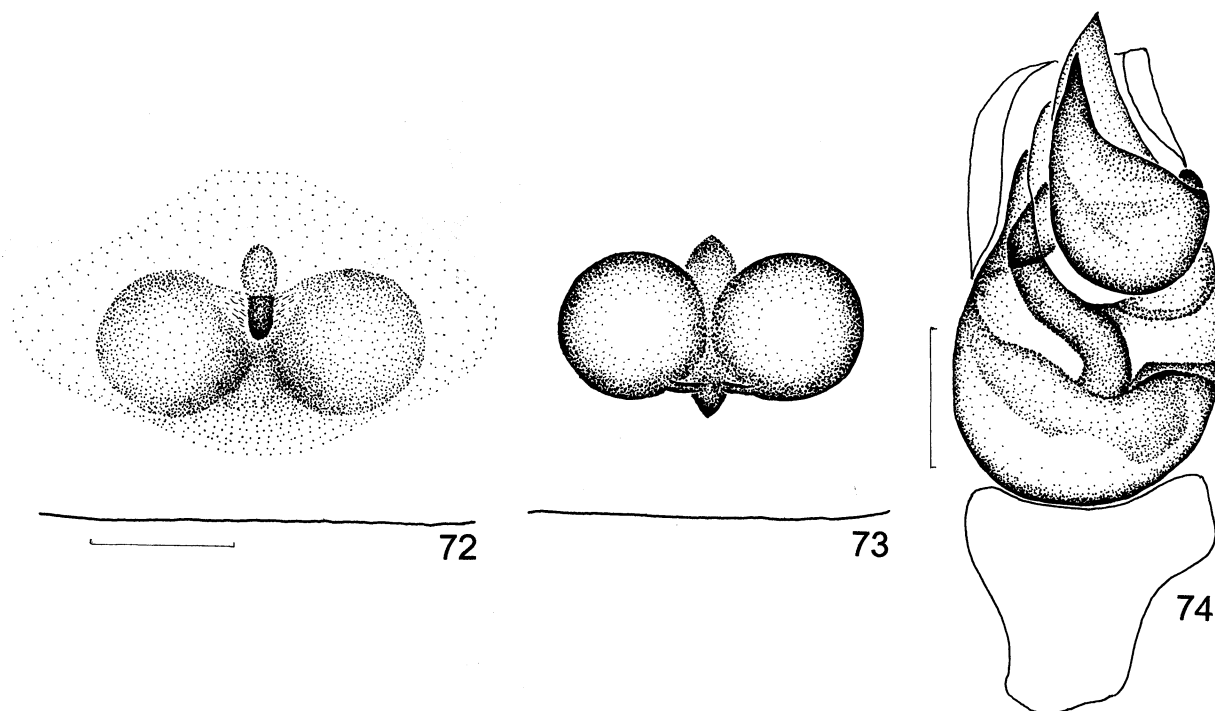
#### *Theridula* Emerton 1882

[Japanese name: Himegumo-modoki zoku]

*Theridula* Emerton 1882, p. 25; Simon 1894, p. 551; Levi 1954, p. 332; Levi & Levi 1962, p. 42; Levi 1966, p. 123; Yaginuma 1986, p. 50; Zhu 1998, p. 74.

**Notes.** Subtegulum, tegular apophysis, median apophysis and conductor of male palpus are lost. Paracymbium is hooded. This genus is the most specialized group in Theridiinae.

In this genus, 16 species have been recorded from the world (Platnick 2001), and two of them, *T. gonygaster* (Simon 1873) and *T. opulenta* (Walckenaer 1842), have been known from Japan (Bösenberg & Strand 1906; Saito 1941; Yaginuma 1986; Chikuni 1989). However, the record of *T. opulenta* in Japan (Bösenberg & Strand 1906; Saito 1941) was due to the



**Figs. 72–74.** *Chrysso albipes* (S. Saito 1935), ♀♂ from Rishiri Is., Hokkaido—72, epigynum, ventral view; 73, female internal genitalia, dorsal view; 74, male left palpus, ventral view. Scales: 0.1 mm.

distribution of this genus (Simon 1894). I regard that *T. opulenta* is not distributed in Japan, because no specimen has been collected by Japanese arachnologists.

***Theridula iriomotensis* new species**

[Japanese name: Iriomote-himegumo-modoki]

(Figs. 75–78)

**Diagnosis.** This species is easily distinguished from the other ones of this genus by the abdomen grayish brown with many black flecks, and the male palpus with straight embolus and long tarsus.

**Description.** Carapace oval, head region high and eye region projecting; clypeus slightly projecting; eyes relatively large compared with carapace. Abdomen dorsally flattened; slightly wider than long.

Female genital organ as shown in Figs. 76–77: seminal receptacles seen from outside; epigynum with three median pairs of long macrosetae. Palpal organ as shown in Fig. 78: embolus straight; tarsus long, about 3 times longer than wide.

**Coloration.** Carapace dark brown, eye region darker, with median and marginal dark flecks. Chelicerae, maxillae, labium and sternum dark brown. Legs brown with a black ring on distal part of femora and many ventral black flecks on all segments. Abdomen grayish brown

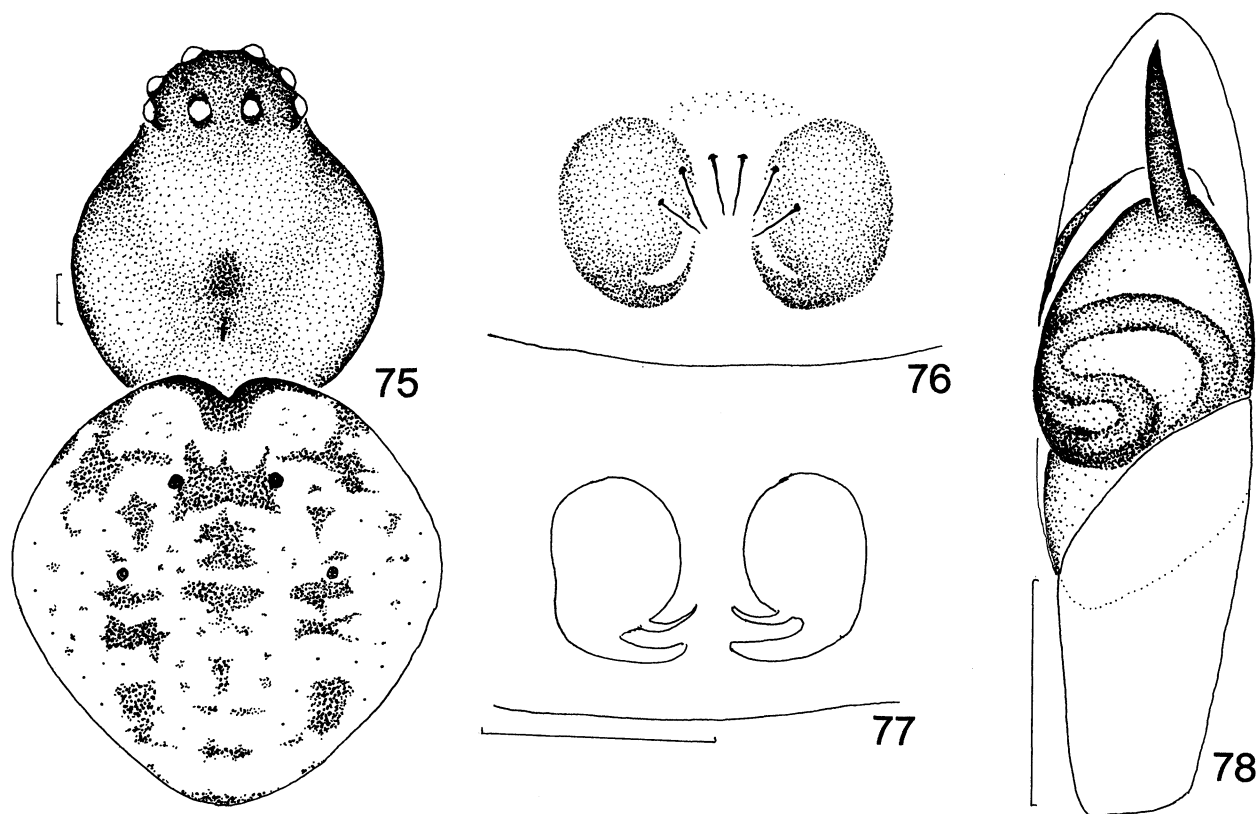
with many dorsal and anterior black flecks and sclerotized blackish brown spots as shown in Fig. 75; venter marginally dusky.

**Measurements** (in mm. ♀ holotype/♂ allotype). Body length 1.53/1.42. Carapace length 0.74/0.68; width 0.63/0.55. Abdomen length 0.87/0.74; width 0.89/0.84; height 0.82/0.71. First leg: femur 0.68/0.66; patella and tibia 0.74/0.71; metatarsus 0.47/0.42; tarsus 0.30/0.32. Second patella and tibia 0.66/0.59; third patella and tibia 0.47/0.39; fourth patella and tibia 0.58/0.47. AME 0.09/0.08; ALE 0.05/0.05; PME 0.08/0.07; PLE 0.08/0.07. AME-AME 0.07/0.05; AME-ALE 0.01/0.01; PME-PME 0.04/0.05; PME-PLA 0.05/0.05. MOA, AW 0.21/0.21; PW 0.17/0.17; L 0.18/0.18.

**Variation.** Body length 1.34 to 1.87 in female and 1.21 to 1.42 in male. Carapace length 0.68 to 0.74 in female and 0.68 in male. Abdomen length 0.79 to 1.29 in female and 0.66 to 0.76 in male.

**Type series.** Holotype: ♀, Sonai, 28-III-1989 (NSMT-Ar 5165). Allotype: ♂, Komi, 30-XII-1989, (NSMT-Ar 5166). Paratypes: 2♂, 30-XII-1985, 1♂, 13-VIII-1992, Komi, (NSMT-Ar 5167-5168); 1♀, Otomi, 30-III-1989, (NSMT-Ar 5169); 1♀, Funaura, 25-VIII-1988, (NSMT-Ar 5170). All collected by Akio Tanikawa from Iriomote Is., Okinawa Pref., Japan.

**Other specimen.** 1♂, Nagano, Jinseki-cho, Hiroshima Pref., Japan, 17-V-1996, K. Nojima leg.



**Figs. 75–78.** *Theridula iriomotensis* new species, ♀ holotype and ♂ allotype—75, female carapace and abdomen, dorsal view; 76, epigynum, ventral view; 77, female internal genitalia, dorsal view; 78, male left palpus, ventral view. Scales: 0.1 mm.

**Distribution.** Japan: Honshu (Hiroshima Pref.) and Iriomote Is. of the Yaeyama Islands (southern most islands of the Nansei Islands).

**Notes.** This is the second species of this genus from Japan.

*Theridula gonygaster* (Simon 1873)

[Japanese name: Hoshi-himegumo-modoki]

(Figs. 79–82)

*Theridula gonygaster*: Levi 1954, p. 340, figs. 18–22; Levi 1966, p. 127; Yaginuma 1986, p. 50, pl. 11, fig. 10; Chikuni 1989, p. 40, fig. 50; Zhu 1998, p. 75, fig. 43; Song et al. 1999, p. 148, fig. 83H–J.

**Specimens examined.** 1♀, Matsuzaka-shi, Mie Pref., 30-VII-1974, K. Kaihotsu leg. (CYC); 1♀, Tokushima-shi, Tokushima Pref., 24-VI-1975, Y. Chikuni leg. (CYC); 1♂, Koniya, Amami-oshima Is., Kagoshima Pref., 13-VIII-1978, H. Yoshida leg.; 2♀, 28-III-1988, 2♀, 1♂, 1-IV-1988, Komi, Iriomote Is., Okinawa Pref., A. Tanikawa leg.; 1♀, Midara, Iriomote Is., 2-IV-1996, A. Tanikawa leg.

**Distribution.** Japan: Southern part of Honshu,

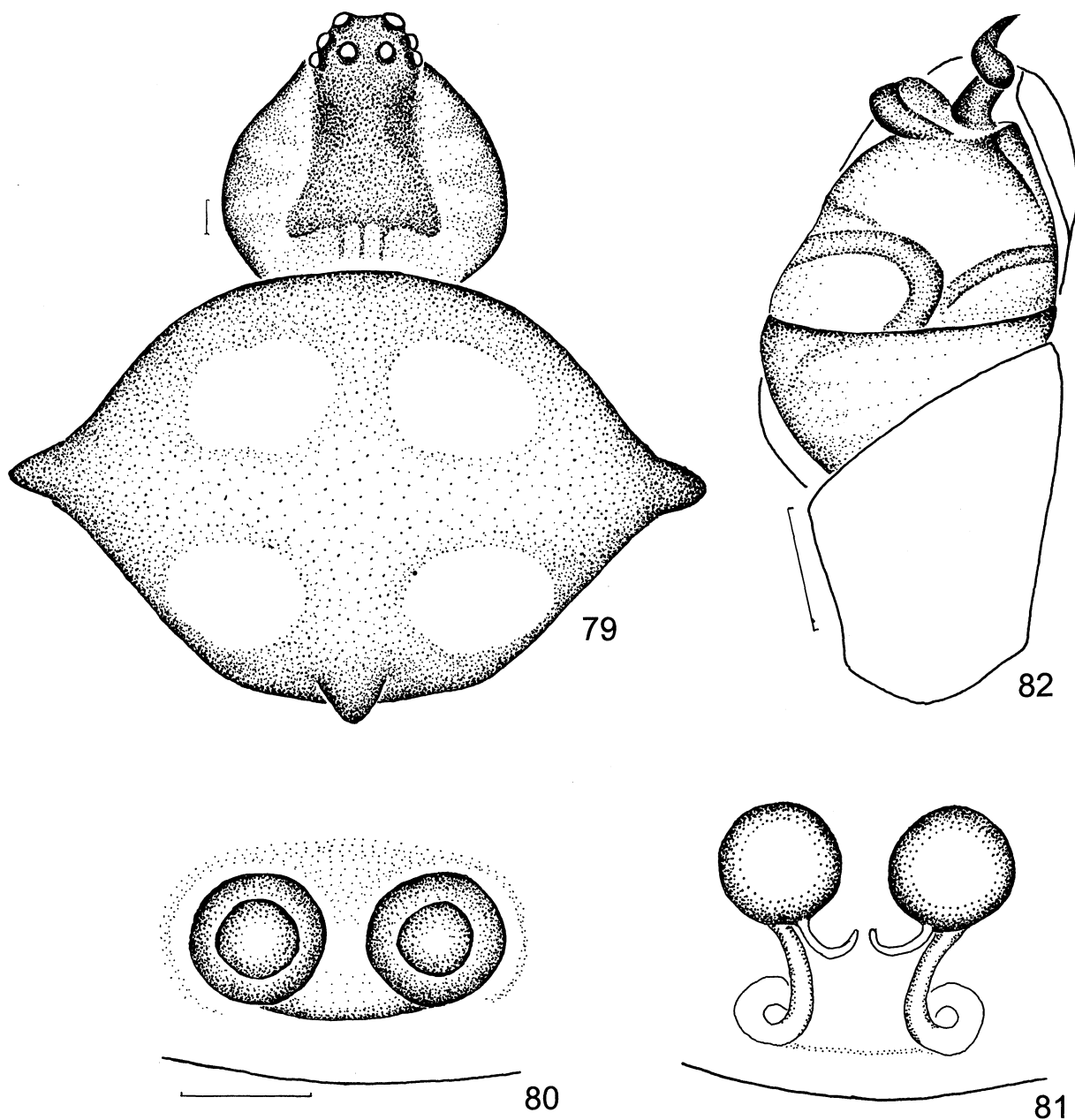
Shikoku, Kyushu and the Nansei Islands. Widely distributed in tropical area of the world.

**Notes.** Female carapace and abdomen, and genital organs are illustrated in Figs. 79–82 based on Japanese specimens.

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**Figs. 79–82.** *Theridula gonygaster* (Simon 1873), ♀♂ from Iriomote Is., Okinawa Pref.—79, female carapace and abdomen, dorsal view; 80, epigynum, ventral view; 81, female internal genitalia, dorsal view; 82, male left palpus, ventral view. Scales: 0.1 mm.

paper.

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